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MR. WALDRON'S description of his new automatic stop, which we print in another column, is of interest by reason of his long and intimate experience in that field. The Interborough uses a mechanical trip stop and probably has had a longer and more extensive experience with stops than any other road. Knowing all of the demands that are or ought to be made on a stopping apparatus, and familiar with the responsibility of keeping such an apparatus in a state of highest efficiency, Mr. Waldron assures his readers, so far as assurance can be given on the basis of experience with a single installation, that the new arrangement meets all requirements. Details of the scheme are patented, and we have taken the liberty of calling it "Waldron's Stop." This experiment of Mr. Waldron serves as a reminder that the field of usefulness of automatic stops is perhaps expanding. For underground railway lines the mechanical stop which he has used for the past six years answers satisfactorily; but the extension of tunnel and elevated lines several miles out into the suburbs, with tracks laid on the surface of the ground, which is now an actual condition to be dealt with on two lines in the New York City district, brings in the problem of snow and ice; and so a non-contacting device becomes a desideratum. If the surface portions of such underground and elevated lines are operated without automatic stops we at once have the inconsistency of trusting the engineman more fully on one part of his run than on other parts.

A NEW YORK railway has asked the New York State Public Service Commission, Second district, for leave to discontinue its station at W, and establish a new station at L, 1¼ miles south of there, but has been refused. It appears that the only reason offered by the road for desiring to relocate the station was that the proposed new situation was on a straight and level piece of road, whereas, at W, northbound trains approach the station through a rock cut and around a sharp curve. The new location "would be better adapted to the safe operation of trains." But the citizens all with one consent, protested against the change of location, and the commission finds in their favor, declaring that the road had not substantiated its claim that the new place would be safer. The natural conclusion of the reader will be that the road had reasons which do not appear in the published report; but aside from that, there is a little moral in the incident; and that is that with the spirit of inquiry that prevails in the New York (and other) commissions nowadays it is a waste of time for a railway company to offer assertion in the place of demonstration. Another moral is that a railway is bound to make all of its stations safe. If L is safe, W is less safe; and that is a condition that needs to be changed. In view of the large number of curves and cuts on the railways of America it would seem that the only satisfactory rule of operation would be one that gives the highest possible safety at all points. And there is no lack of examples of this best practice; as, for instance, in the dark subways and tunnels of New York City, with their high speeds and frequent trains, or in the snow sheds of the Sierras, with their steep grades and sharp curves.

THE New Haven, Middletown & Willimantic Railway, a line about 50 miles long, was opened in 1870. It fell into financial trouble, defaulted on the interest of its first mortgage bonds of $3,000,000, and was reorganized as the Boston & New York Air Line in 1875, preferred stock being offered for the bonds and common stock for the overdue coupons. In the year 1906 after the contract for the sale of the road to the New Haven Company had been made, but before it was ratified, a holder of a large amount of the old defaulted coupons of a date some 34 years previous, presented them and demanded common stock. It was refused, and now suit has been joined on the demand in a Connecticut court—the matter being complicated by the fact that many of the Boston & New York Air Line records have been destroyed by a fire. One cannot, of course, prejudge a case of the kind, yet its interesting and im-

portant elements are obvious and its outcome of legal value, especially should the case be appealed. It raises such points of law as the time factor in railway reorganizations, the rights of the original security holder as against a corporate and—in a sense—public interest, and the old question of the scope of the theory of "sleeping on rights," whether running against the corporation or the security holder. More remotely the case bears on the whole general subject of compulsion in exchange of one set of railway securities for another, whether in a reorganization or otherwise. There have been legal rulings on the subject varying with differing conditions and with the statutory law. But rarely, if ever, a case like this in Connecticut with the corporate records extinct and nearly 40 years after the original default which led to reorganization, to the common stock issue and to the present case at bar.

THE Interstate Commerce Commission will find very few lawyers who are familiar with the Mann-Elkins act and the circumstances in which it was passed, who will agree with it that it has authority to suspend a reduction in rates. Nothing was said in the discussion of the Mann-Elkins Act in Congress to indicate that Congress had the slightest intention to give the commission such power. Until the Mann-Elkins Act was passed it had no authority over any rate until it had gone into effect. The sole intention of those who advocated the provision empowering the commission to suspend changes in rates was to enable it, while it was investigating advances, to prevent them from being put into effect. Not only does every one who followed the progress of this legislation know this to be true, but the language of the legislation itself plainly indicates what Congress meant. The Hepburn act authorized the commission, when it found rates already in effect to be unreasonable or unduly discriminatory, to fix the maximum reasonable rate to be charged in future, and the Mann-Elkins act, after authorizing it to suspend new rates pending investigation of them, says: "And after full hearing, whether completed before or after the rate, fare, charge, classification, regulation or practice goes into effect, the commission may make such order in reference to such rate, fare, charge, classification, regulation or practice *as would be proper in a proceeding initiated after the rate, fare, charge, classification, regulation or practice had become effective.*" In other words, all it can do, after it has suspended a proposed reduction—assuming it can do so at all—and given a full hearing regarding it, is to fix the maximum rate to be charged, leaving the road or roads concerned perfectly free to go ahead and make the very reduction which it has temporarily suspended. There is no doubt, as already has been said in these columns, that the language of the law is susceptible of the construction that it empowers the commission to *suspend* any change in rates; but everybody who followed the Mann-Elkins act through Congress, including every member of the commission, knows that this is not the construction Congress intended to be put on it. The commission has tried to write into the law what was not there before, or at least what was not intended to be put there. If in future the courts, by judicial legislation, shall take away authority from it which it may think Congress meant to give it, complaints from it on that score will come with very bad grace. The *Railway Age Gazette* would like to see the commission have the power it claims it has. It should be given the additional power of fixing minimum rates where a road has made or tried to make rates that are or would be unreasonable or unfairly discriminatory because too low. But no friend of good government can regard with equanimity the disposition shown by the commission in this case to seize on any sort of authority it may think it would be convenient for it to have, in disregard of the manifest intention of Congress.

WITH the revival of Wall street activity and some signs, not as yet too conclusive, that genuine investment activity has revived also, the future of railway financing grows interesting. The last three years have seen the post-panic period of 1908, the quick but transitory revival that followed it and the succeeding depression coming with the great increase of railway wages, the assertiveness of organized labor and a certain renewal of governmental activity—to which has been added state legislation of a more or less restrictive character. With lighter streaks now on the general horizon and a better feeling as to railway stability, what form will be predominant in railway financing, belated by past adversity? Will it seek stock, bonds, the intermediate form of convertible bonds, or the short term note? The latter has become a popular security on the ground of its early maturity into cash which the investor wisely deems a good thing to have come in during a period of perturbations of the investment market. For the same reason, the railway corporation dislikes the short note as being a temporary expedient to bridge a gap calling soon for new cash for its redemption. Then there is, finally, the big, general, blanket mortgage, as illustrated by the plan of President Hill, which form of mortgage has the advantage of final security combined with flexible adjustment to maturing obligations—and almost every large railway has large equities not only in the whole system but in many of its component parts. While each railway corporation is a law unto itself in this question of future financing, the outlook points to the general mortgage, the convertible bond and new stock, in that order, with considerable stock issues contingent on the revival of good earnings. With growing competition in bonds of the tractions and minor industrials it does not look, however, as though the railway corporations would be able to borrow money more cheaply; on the other hand, it seems likely that at the old rates they will be able to borrow more readily. This is not merely because investment funds are likely to come out but because the Standard Oil and Tobacco decisions have reduced on the railways the federal stress now shifted to the large industrial combinations. The Sherman act was not aimed at the railways, but for many years they bore most of its brunt and were a lightning rod for the big industrial concerns. Pending the many future legal interpretations of the adjective "reasonable," the situation becomes reversed and the railways are not so much of a federal target, with corresponding financial betterment as borrowers.

UNIFORM ACCOUNTING FOR MATERIAL AND SUPPLIES.

THE need of more uniform methods of accounting for the material and supplies used by railways has been commented on in several recent articles which have appeared in these columns, notably in the paper presented at the last meeting of the Railway Storekeepers' Association by H. C. Stevens of the Mexican National Railways. The greatest drawback to increased efficiency in the supply department at present is the absence of any means of making a reliable comparison of the operating results obtained by the departments on different roads. The first step necessary toward making such a comparison possible is the adoption of absolute uniformity in the methods by which the results arrived at are set forth. This does not necessarily mean that each detail of routine must be the same, but that a few general principles should be laid down and rigidly adhered to by all.

No one is more keenly alive to the desirability of such action that are the members of the Railway Storekeepers' Association; the men who are on the firing line every day and a part of the nights. The association has made this a prominent feature of its work ever since its organization, and has labored faithfully for the desired end. As a necessary basis for uniformity of practice in this respect it has worked out and agreed on a thoroughly practical classification of material and has recommended its adoption by all the railways. It has adopted the report of its Committee on Recommended Practices which laid down the following fundamental principles to be followed in accounting for material:

First.—That disbursements be considered the unit of comparison by which the stocks of material on hand shall be measured, using for a basis the average issue for the twelve

months preceding the time at which comparison is to be made.

Second.—That disbursements shall include only material actually used or disposed of; that it be recognized that such small items as station and track supplies, issued in small quantities for current requirements may be charged out directly when issued, but that, generally speaking, no material or supplies shall be charged out until actually used or otherwise disposed of.

Third.—That transfers of materials from the store department to other departments, or from one store to another, be not considered issues except in so far as such transfers affect individual stores.

Fourth.—That labor expended in maintenance or construction of equipment be excluded from material disbursements.

Fifth.—That material in process of manufacture, including the labor expended on it, be included in material stocks until actually used in the finished state.

Sixth.—That scrap be taken into the material account as soon as delivered to the storekeeper, and carried in that account until disposed of.

Seventh.—That temporary track and material suspense accounts be excluded from material stock balances.

There seems to be no sound objection to the adoption of these general principles of supply department accounting by every railway which is desirous of knowing all of the facts concerning the material in its possession. The Storekeeper's Association already has secured the co-operation of the Master Mechanic's, the Master Car Builders' and the American Railway Engineering Associations in the adoption of uniform specifications and grading rules for lumber used by the railways. It has asked for the co-operation of the Association of Railway Accounting Officers in its efforts to secure a uniform method of accounting. That such co-operation would be in the interest of increased efficiency, seems certain; but only the chief executive officers can definitely state whether or not it shall be given.

TURBINE LOCOMOTIVES.

THE mechanical simplicity of the turbine steam engine makes it an attractive motor for any service to which it can be economically applied. It is being used extensively in power houses, and is rapidly making its way into marine service. The conditions under which an engine works in propelling a ship are in some respects similar to those required for locomotive service. There is the heavy torque in starting, the operation under variable speed, and the necessity for reversing; all of which are found in locomotive operation. Once under way the steamship continues at nearly uniform speed for days and nights for a full week, and the most economical performance should be obtained at this speed. The locomotive must work continually under variable speeds and loads and any substitute for the reciprocating engines must show an equal or better economy when working under these conditions.

The principal feature which would make the application of the turbine to the locomotive advantageous is the possibility of much higher speed with smooth running. With the motions all rotary and in perfect balance, high velocities can be obtained without oscillation, and if the application can be worked out in a practical way it might be worth while to obtain high speed in this way even if a slight loss in economy attended the operation. Such construction, working smoothly, should have a longer life and a lower maintenance cost than the present reciprocating engines.

These considerations have made the turbine locomotive an attractive field for invention, and a number of patents have been taken out to cover various methods of application. In Milan, Italy, the project has been carried so far as to equip a small locomotive with specially designed turbines and its performance has been successful. The peculiar feature of this turbine is the use of movable blades, which are operated in series. Four sets of such blades are used and at high speed the steam strikes the first set of blades only, while at intermediate speeds two sets or three sets can come into play. The reversing mechanism is a special and unique feature of this motor. The rotors have two sets of blades which are of opposite curvature. When running in one direction the steam passes over the blades at the outer circumference from left to right; when running in the opposite direction steam passes over the other sets of blades from right to left. In either case the loss of energy due to the blowing action of the second set of blades only amounts to a small fraction of the total, and the experiments show it to be 2 to 3 per cent.

Locomotive conditions require the engine to be started under maximum load, to accomplish which the steam must act on all the blades at once, and in this way the maximum turning moment is obtained with the least expenditure of steam. The Milan experimental turbine locomotive started well under load both on curves and gradients, and the consumption of steam has not exceeded 38 lbs. per horse power hour for revolutions in either direction. The spiral worm and wheel speed reducing mechanism has been worked out so successfully for large powers that it seems probable that it will be applied to the locomotive so that high velocities can be employed for the turbine, enabling it to work at economical speeds when the engine is operating at moderate speeds.

FEDERAL TAXATION OF RAILWAY RENTALS.

A NOVEL and important point is raised under the federal corporation tax law recently declared constitutional by the United States Supreme Court. The federal authorities claim the right to tax railway rentals of leased lines as a separate form of net profit. To illustrate the case, if a lessee railway company pays rental of say $100,000 a year for a leased line—assuming, of course the underlying charges—the $100,000 is treated by the government as net income and the regular tax of 1 per cent., or $1,000, is imposed. This particular branch of the general tax as well as the general tax itself on the net income of the main company was paid under protest last year by the New York, New Haven & Hartford, which—as probably also other railway corporations—will carry the matter to the courts. The fundamental tax has been validated by the highest tribunal in the land. Now arises the case of the validity of a tax within the tax, and some nice questions of technical law and equity spring from it.

Taking up first the question from the viewpoint of the federal taxing authority, there is to be emphasized the main object of the law; namely, the impost and collection of the 1 per cent. tax on net revenue of a railway—or other corporation—before that net revenue reaches the share owner for distribution as a dividend. Rental of a railway in some respects takes the outward form of such net revenue. Moreover, it is the revenue of a lessor corporation which has not lost its corporate identity, or usually has not done so. Leased lines of railway have their own separate boards of directors, presidents, treasurers and secretaries. They meet once a year, and while their doings are in most cases perfunctory and formal they are by no means necessarily so. They are, for instance, charged with safeguarding the provisions of the lease as against the policy and acts of the lessee. Again—still viewing the case from the federal standpoint—the rental is the only objective of taxation which the taxing power can reach. For, in well nigh every case of a leased line, operation and its returns are merged with those of the lessee corporation. Unless separate accounts are kept of the leased line and the present system readjusted, and bookkeeping and returns of operation much amplified, the taxing power has nothing but the rental as a test of the net income of a leased line to be used as a basis of the tax. Otherwise it must either insist on separative leased line accounts or see the rental pass and be merged in the general account of the lessee, and, very likely, entirely disappear, and the tax with it.

On the other hand, look at the case from the viewpoint of a lessee railway company! The federal corporation tax is obviously one on a "business," and the lessee has taken over the

whole business of the lessor. Practically, and so far as concerns operation and returns, the leased line is merged. Its segregated character as an operating corporation has quite vanished. But the matter does not stop there; for the rental may or may not intrinsically represent a form of taxable revenue to the lessee, whatever it may be for the lessor shareholders. A railway lease may be highly profitable or very unprofitable. It may be taken by a lessee to keep a line from a rival. It may be taken upon a branch line with decided loss on the branch line business, but with offsetting gain—or the hope of it—from business fed to the lessee. But under the federal ruling there is no discrimination between the lease profitable and the lease unprofitable. In the first case the tax would be too small; in the latter, too large. To take extreme hypothetical examples, if the lessor pays a rental of $100,000 and gets a profit of $100,000 in addition from the leased line the tax should be $2,000 instead of $1,000. But if it loses $100,000 in operation of the leased line the federal government is actually taxing a deficit of that amount and not an income. It shows clearly the radically unscientific nature of the separate rental tax.

On the technical side of the question may be cited the opinion of the Supreme Court in the Minneapolis Syndicate case, where it was held that a corporation holding title to the real estate on which it had given a long lease and did nothing except receive rent and disburse it as dividends to stockholders was not doing business and not liable to the tax. But that is a precedent for the courts to apply, and we are considering here more the equities than the law of the rental tax.

It is a broad truism in the records of state and local taxation of American railways that it has taken about every snape that the wit or selfishness of man could devise. The federal taxation of railway rentals at least suggests a starting point of like complexities in federal taxation also. It opens also a somewhat wide vista in the future. The federal tax is now 1 per cent. on net income and is valid. It is a flexible tax. Its machinery is already in operation. Exigencies of the federal treasury may readily increase it. As applied to railway rentals it can be evaded by substituting merger for lease. Should the rental tax be sustained and, especially, should the rate much increase, a new incentive in railway policy arises in favor of mergers as contrasted with rentals—in favor, that is to say, of purchasing lines or acquiring them by exchange of securities rather than leasing them under a rental indefinitely and perilously taxable. This applies equally to existing and future railway rentals. It is one suggestive aspect of the corporation tax law in its bearing on the railways—and there are others.

NEW BOOKS.

Electric Railway Dictionary. By Rodney Hitt, associate editor, *Electric Railway Journal.* Published by the McGraw Publishing Company, New York. Leather, 8¾ in. x 12 in. Price, $5.

The publication of this dictionary is in accordance with a resolution adopted by the American Electric Railway Association at its Atlantic City Convention, October 14, 1908. The editor was assisted by a supervising committee composed of H. H. Adams, of the Metropolitan Street Railway Company, New York; Paul Winsor, of the Boston Elevated Railway; and Richard McCulloch, of the United Railways of St. Louis. The book contains definitions of the technical terms used in the electric railway field; and the nomenclature of the manufacturers has been retained in most instances so that little trouble will be experienced in consulting the book in connection with catalogs and other manufacturers' literature. There are 1987 illustrations showing different types of electric cars and many of their important details. The first part of the book contains the definitions arranged in alphabetical order, and the remaining part the illustrations, which make possible their logical arrangement and permits of easy reference to the definitions. Where more than one name is commonly applied to a part, the preferred name is defined and the other names are also given in their proper places with a cross reference to the preferred name.

Letters to the Editor.

THE PAY OF OFFICERS AND EMPLOYEES.

Chicago, May 6, 1911.

To the Editor of the Railway Age Gazette:

The editorial in your issue of May 5 on the inequality of the rates of pay of subordinate railway officers, as compared with those of train and enginemen, calls attention to a very prevalent injustice. Several western roads last spring found it necessary to raise the salaries of their yardmasters and assistant yardmasters following the increases granted to the switchmen, in order to keep the pay of these yardmasters above that of the switchmen. It is often difficult to get a road conductor to accept the position of yardmaster with the attendant grief that position brings. Many trainmasters are receiving less than the higher paid conductors working under their supervision. Such conditions discourage trainmasters; and it is frequently the case that passenger conductors on preferred runs will not accept the position of trainmaster. Notwithstanding the fact that the trainmaster is in line for promotion, his chance for promotion is often regarded as outweighed by the greater responsibility, and insecurity of the position.

The case of a trainmaster on a western road who was promoted from passenger conductor, and who went back to his run shortly before his rights in the train service expired, because of his increased responsibility and "raw-hiding" as trainmaster, probably has been duplicated many times.

The same condition exists in the engine service. Many enginemen are receiving wages closely approximating those of the master mechanics and largely exceeding those of the road foremen of engines; yet the engineman can step down from his engine at the end of perhaps a six-hour run, knowing that he is certain of at least eight hours' rest without interruption. The same cannot be said of his superiors, who are subject to call at any hour. While one cannot blame organized labor for getting all it can for its work, yet the salaries of those in positions of responsibility should be made more commensurate with this responsibility.

One who got less.

RIGID VS. NON-RIGID FREIGHT TRUCKS.

Chicago, May 2, 1911.

To the Editor of the Railway Age Gazette:

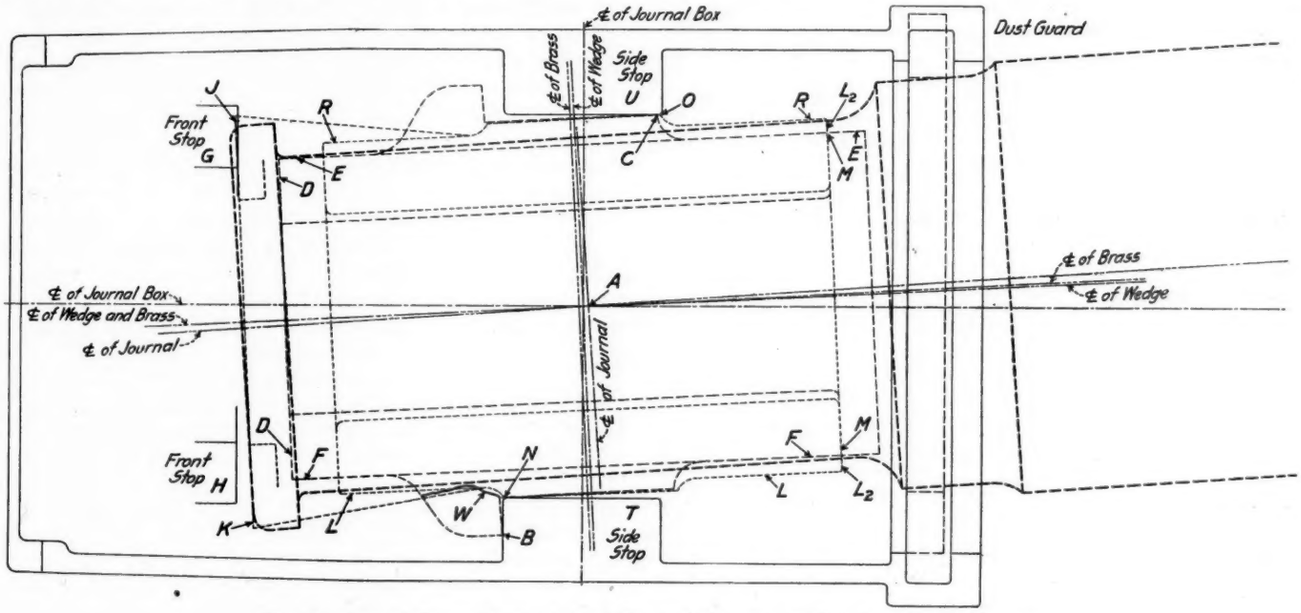
The recent discussions on rigid vs. non-rigid freight trucks have not been clear as to whether the trucks were rigid or non-rigid in a vertical or a horizontal plane. A few years ago trucks rigid in the horizontal plane, as well as in the vertical plane, had considerable vogue, but there are not very many of them purchased now. The rigid trucks in the horizontal plane were condemned, for the reason that when one of the wheels found a low spot in the track it did not carry its proportion of the load because the other three wheels determined the horizontal plane of the truck. We may assume, therefore, that in all the recent discussions on rigid and non-rigid trucks, the vertical plane is considered; that is, that the truck should be so constructed as to hold the axles perpendicular to the side frames.

The recent report of Professor Louis E. Endsley, of Purdue University, shows that the total movement of some of the non-rigid trucks that ran out of square, was as much as 5.61 in., half of which, 2.8 in., is the amount the truck ran out of square. Since then, however, we have found trucks with a total movement of 6¼ in. of the side frames, or 3⅛ in. out of square. To determine the position of the standard M. C. B. parts, such as the brass, wedge and journal in the journal box, and in an effort to determine how much the journal box and contained parts play in resisting the trucks running further out of square, we laid out the plan view of a journal box and the contained parts with the truck 5¼ in. out of square, as illustrated here-

with. It will be noted that there is not room enough for the contained parts in the standard M. C. B. journal box with the truck so far out of square. The distance between the centers of the journals as measured on a line perpendicular to the side frame is reduced about ¼ in., due to the angularity of the axle. This causes the brass to take up the play allowed between the rear of the wedge and the flange on the brass, which forces the wedge toward the front stops. The wedge laps over the front stop *G* at the point *J* about 1-32 in. The brass laps over the collar of the journal at the point *D* about 1-16 in., and the side lug on the brass binds the wide stop *T* of the box at point *B*. Both wedge and brass bind at *N* and *B* on the side stop *T*, and at *C* and *O* on the side stop *U*. The lines *EE* and *FF* of the brass are considerably out of parallel with the lines of the journal.

We infer from this that a truck would not run so far out of square without something in the journal box yielding by springing or breaking, and from the information gained through laying out the drawing, we concluded that if these trucks really ran out of square excessively, and if the truck depended on the cramping of these parts to resist its running more out of square, the parts that were called upon to resist this excessive movement must show it by excessive wear or breakage. On inspecting a number of these trucks, we found the brasses in a large percentage of cars with the lugs broken off as shown by line *W*. Some of the trucks seemed to have no other means of holding them square except the angularity of the journal causing a binding of the brass and wedge between the side stops of the box and the binding of the wedge on the front stop *G* of the box. This, if the brass, wedge, or the front stop of the wedge do not break, must cause excessive end wear of the journal collars and brass, and a diagonal wear of the brass or bearing on the journal, all of which must tend toward the increased liability of hot boxes and excessive frictional resistence. From the number of brasses found with broken side lugs, it is fair to assume that a large proportion of these trucks depend on this resistence in limiting the distance they run out of square. It is interesting to note that on the inspection of a large number of cars whose trucks were constructed in a manner that was meant to hold them square, only one brass was found with the side lug broken off, and that was on a truck the spring plank of which was made of two angle irons securely riveted to the arch bar columns, and where one of the angle irons had broken, which made it a flexible truck.

W. J. SCHLACKS,
McCord & Company.



Truck Journal Box and Contained Parts With Truck 5¼ In. Out of Square.

ORGANIZATION OF THE SUPPLY DEPARTMENT.

CHICAGO, June 8, 1911.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The discussion of Mr. Pearce's admirable papers on the supply department (recently republished by you in book form) which has been started by Mr. McVeigh, and commented upon editorially in your columns, is both timely and instructive, and should bring out a good deal of valuable information on a subject of which far too little is known.

That so little definite knowledge exists in regard to the best methods of organization and operation of the modern railway supply department does not seem strange when the recent origin of this department and its rather uncertain status and haphazard growth are considered.

Even today there is no unanimity of opinion among the chief executive officers as to where the responsibility for the conduct of that very important branch of the service should be lodged. Mr. Pearce and Mr. McVeigh do not agree on that point, although they have both seriously studied the question from the standpoint of practical experience. They also differ on the more vital question as to the respective merits of the divisional or the departmental form of organization as applied to the supply department.

Mr. Pearce's papers are by far the most valuable contribution to the literature on this subject which I have seen—and yet Mr. McVeigh's questions are pertinent, and his position is well taken. In an article appearing in your columns some time ago [July 30, 1909], I tried to point out the widely varying results which were apparently being secured by the supply departments of different prominent railways, and commented on the lack of uniformity in methods which precluded any really intelligent comparisons being instituted.

Mr. McVeigh very properly makes this lack of comparable evidence the basis of the issues which he raises, and claims that in the absence of definite data our best efforts must be merely statements of opinion, and in this he is right.

On the other hand, until the conditions have been so shaped that such a comparison can properly be made, the preponderance of the opinions of those who have made a careful study not only of the practical details, but of the general results obtained under various methods, must act as a guide for future development.

Venturing, therefore, another expression of opinion on the divergent views outlined above, I believe that the form of organization advocated by Mr. Pearce is calculated to produce the best

results for the railway as a whole. It must not be forgotten that the different branches of the railway service vary so widely in their nature that no hard and fast rules can be laid down which will apply to all with equally good results. Divisional organization may be the ideal form for some branches, but would be totally inadequate when applied to others. I do not believe that Mr. McVeigh would advocate divisional organization applied to the treasury department; and yet unapplied material is simply money in another form.

Admitting that the divisional organization is the best that has been devised for the operating or transportation department, it does not necessarily follow that it is equally good for the supply department. The division superintendent is primarily an operating or transportation official. His responsibility begins and ends with the limits of his division; he is not concerned with the results obtained on any division but his own. The responsibility of the supply department must be co-extensive with the limits of the entire road which it serves, and in order to secure the best results for the whole railway it must act as a unit and not as a series of independent units.

Carrying Mr. McVeigh's scheme of organization only one step farther, we have each division purchasing its own supplies direct, under the supervision of the superintendent—a condition which I do not believe he would seriously advocate, and yet it is the logical result of his line of reasoning. As it is, he seems to advocate the buying of supplies for each division separately, but through one purchasing agent. Apparently his greatest objection to Mr. Pearce's scheme is with respect to the duplication of work entailed by the operation of one general store, through which all supplies must move to the division stores. In taking this position Mr. McVeigh is undoubtedly correct, and I am not sure that Mr. Pearce intends to be taken literally in this regard.

Unfortunately the title "General Storekeeper" is not so distinctive as it might be. It does not necessarily imply that the man on whom it is conferred should be in direct charge of one enormous storehouse to which all material used by the railway must be shipped, and through which it must pass to its final destination. It means, rather, that the official so designated is in general charge of all storekeepers. Personally, I do not think that he should be directly attached to any storehouse, but should properly be located at executive headquarters, just as I believe the superintendent of motive power should not be directly attached to any shop, although on almost every railway there are one or two shops which are larger and more important than any of the others. So there are necessarily one or more storehouses which are of greater importance than the majority, and which necessarily serve in a greater or less degree as magazines of supplies for the smaller divisional stores as well as for outlying points.

These larger and more important storehouses may, if you please, be termed general stores; and it does not detract in any way from the value of the departmental organization that there should be more than one such storehouse on the railway. The local conditions and geographical situation should be determining factors as to the number of these more important depots of supplies, which it will be economical to have, but it is not likely that it would be necessary or expedient to have one of them located on each division, and to that extent I cannot agree with Mr. McVeigh. On the other hand, it is hardly probable that on a railway of any size the operation of the supply department could be so economically conducted if an attempt were made to handle all of the material used by the railway through one general store, and to that extent Mr. McVeigh's contention has a great deal of weight.

We have heard a great deal lately about the "rule of reason," and it certainly applies with as much force to any scheme of organization as it does to the interpretation of the law.

GEORGE G. YEOMANS,
Assistant to the President, Wabash Railroad.

DISTANCE AND FREIGHT RATES.

BY J. F. STROMBECK.

Much needless controversy as to how rates shall vary with the distance freight is carried has resulted from a failure properly to analyze freight rates. Some theorists, as well as shippers, insist that the farther a shipment is hauled the higher in all cases should be the rate charged for the service, because, it is said, it costs the carrier more to transport the shipment. From a superficial knowledge of freight rates this seems to be perfectly sound reasoning. On the other hand, traffic managers earnestly insist that because a shipment is carried an additional hundred miles, or even more; that need not necessarily call for an increase in the rate. But they do not make it clear to the public why this can be so. They feel by intention, and rightly so, that their views are correct, but that does not satisfy the shipper or the theorist. He is not willing to depend upon the intuition of one who, as he is firmly convinced, is fixing freight rates in the interest of the carriers. Thus, on the one hand, there is a false idea as to transportation costs, which results from a superficial knowledge of the subject; while, on the other hand, there is a correct, though probably not always exact, practice, in justification of which convincing arguments are not offered. It is the purpose of this article to attempt to show by sound economic reasoning that while rates should increase with distance, they need not necessarily do so; and not only this, but that under certain conditions it is reasonable and just that a consignment be carried a longer distance at a lower rate than that for a shorter distance.

One thing which is fundamental, and of supreme importance, is a clear conception of railway expenditures. Besides dividend payments, these expenditures may be divided into two classes, which may conveniently be termed constant and variable. Constant expenditures are those which, *broadly speaking and only within certain limits,* do not vary with the amount of traffic carried. They include expenditures for maintenance of way necessitated by the rusting of rails, the rotting of ties and the washout of roadbed; for repairs and renewals of fences and road crossings; for repairs to stations necessitated by the action of the elements of nature; expenditures to replace cars and locomotives that have become out of date; a large part of station expenses; wages of switchmen, flagmen, watchmen, etc., the expenses of the general office; fixed charges, including interest on funded debt, interest on interest bearing current liabilities, rents paid for lease of roads, taxes, etc. Variable expenditures are those expenditures, again broad speaking—which vary with the amount of traffic carried. An increase in the tonnage carried means an increase in these expenditures. They include such items as expenditures for coal, water, etc., for wages of engineers and trainmen, for repairs to rolling stock, and interest on money invested therein, for repairs of roadbed and track made necessary by wear from hauling, and other similar items.

These two kinds of expenditures represent two kinds of transportation costs. The constant expenditures which go on whether any traffic is hauled or not may conveniently be termed indirect costs, because they are not directly connected with any particular shipment. The variable expenditures may, on the other hand, be called direct costs, because they are very closely related to the movement of the traffic. It is very important that these two kinds of cost be kept distinct. It is true, to be sure, that in practice it may become very difficult to separate them with any degree of exactness, but they must be clearly recognized in order to justify any freight rate adjustment.

This point may be further elucidated by a reference to the old turnpikes. The owner of the turnpike charged a toll for the use of the road. This toll was used to pay for the maintenance of the turnpike and interest on the investment, and is analogous to the indirect costs of rail transportation. The wagon driver who used the turnpike made a charge for conveying the freight,

and this charge is analogous to the direct costs of rail transportation.

Thus, a rate is made up of two parts; the indirect, and the direct costs. Dividend payments, for the sake of simplicity, may well be included in indirect costs.

The rate must cover all of the direct costs, or the traffic is carried at a loss, except under certain exceptional conditions. It should contribute a certain amount toward the indirect costs; this amount, as far as possible bearing a fair relation to the amounts which other rates contribute to indirect costs. It is not possible, however, for all shipments to contribute like amounts, but as long as a shipment contributes anything at all toward indirect costs, the carrier is ahead, because of hauling that shipment.

Before considering the effect of distance upon a rate, it will be necessary to make a further division of the rate. The direct costs are of two kinds, those that remain constant irrespective of the distance the shipment is carried, and those that increase directly as the distance increases. The former of these are terminal charges. The cost of loading and unloading less than carload freight, switching carload freight at terminals, billing and other office work, is the same irrespective of whether a shipment moves one or two hundred miles. This is true, of course, only where there is no transfer of goods in transit. The costs, which increase as the distance increases are those for the mere hauling between the stations. After a train is out of the yards the cost of hauling increases directly, and in the same proportion as the distance it runs. A two hundred mile run costs just twice as much as one of but a hundred miles.

This analysis has shown, then, that a rate may be considered as covering three items: (1) terminal expenses; (2) cost of hauling between stations, and (3) indirect costs.

Distance affects the direct costs from the fact that the farther a shipment is hauled the greater is the number of unit distances upon which to distribute the terminal expenses. These expenses per unit distance vary inversely and in the same ratio as the distance. The hauling expenses vary directly and in the same ratio as the distance. Distance affects the indirect costs in that the further a shipment is carried the greater are the number of unit shipments upon which the indirect costs must be distributed.

A concrete case will illustrate the above. Take a certain well equipped railway with 1,000 or more miles of road. This railway secures a carload shipment, which it hauls 200 miles, and on which it earns a gross revenue of $40. Of this amount, say, $20 are required to cover the direct costs, divided $5 for terminal costs, and $15 for cost of hauling, and the other $20 are available for indirect costs. A duplicate shipment is offered for a haul of 1,000 miles. It is assumed that the extra distance does not necessitate any transfers in transit, or additional switching movements. The question is, how much should the carrier receive for hauling the second shipment? The terminal charges, $5, are the same in both cases. The cost of hauling between stations, varying directly, and *in* the *same* ratio as the distance, must be multiplied by 5, making $75. The total direct costs are then $80. These must be earned or the shipment will be carried at a loss. How about the revenue to cover the indirect costs? In the case of the first shipment $20 were earned. The second shipment, being carried five times as far as the first, ought to earn more toward indirect costs than the first, but it is possible that the freight is of such a nature that a charge of over $100 on it will prevent it from moving. If that be true, it is surely better for the carrier to accept the shipment at $100 and earn the $20, than to refuse to haul it. In that event, for each unit distance the second shipment is carried, the road will get only ⅕ as much as the first shipment; but the total will be the same, and the $20 earned on the second shipment will be just as good to the railway as that earned on the first. In the one instance there are 1,000 units of distance over which to distribute the $20, while in the other there are but 200.

Thus, the amount for indirect costs that must be earned per unit distance carried may vary universely and in the same ratio as the distance without reducing the net revenue to the carrier.

This can be carried still farther—so far in fact, that the indirect costs per mile may decrease in a greater ratio than the distance increases. The shipment in question may be offered for a haul of 1,100 miles. But it was said that the maximum charge that it will bear is $100. If the carrier will not haul it for this he can not haul it at all. What is he to do? He figures $5 for terminal expenses. The extra 100 miles mean an addition of $7.50 to the cost of hauling, making a total of $82.50, and a total of direct costs amounting to $87.50. This leaves $12.50 to be applied to indirect costs. Not a very large sum to be sure, but it certainly seems to be good business on the part of the carrier to accept this shipment.

It is evident that at some point, which in the case in question is between 1,200 and 1,300 miles, the cost of hauling becomes so great as to prevent any amount from being left over for indirect costs, and when that point is reached the rate must be increased almost in the same ratio as the distance; for by that time the terminal expenses have become very insignificant. If the traffic can not bear a higher charge it is no longer subject to transportation.

Frequently a shipment can not bear as high a charge to a distant point as to a nearer one, because of water competition at the more distant point. In all such cases, it is both possible and profitable for the rail carrier to meet the water competition as long as the increased distance is not so great that the increased cost for hauling alone consumes all of the revenue which should be applied to indirect costs.

The proposition may possibly be made still clearer by using a rate, for illustration, instead of total charges on a given shipment. The distance from A to B is 100 miles, and the rate is 50 cents per 100 lbs., divided as follows: 5 cents for terminal expenses, 15 cents for hauling, and 30 cents for indirect costs. Problem: Find a rate from A to C, a distance of 500 miles, with no transfers en route, which will be as profitable to the railway as the 50 cent rate from A to B. The terminal costs, namely 5 cents are the same for both. The cost of hauling, increasing in the same ratio as the distance, is 75 cents. To be as profitable as the first, the second rate must include 30 cents for indirect costs. The rate from A to C will be the sum of 50 cents, 75 cents, and 30 cents, or $1.10. The rate per mile is 5 mills in the first and only 2.2 mills per mile in the second case.

The reader has probably already noticed that all rates have not the same amount of elasticity, and will not lend themselves to the same amount of variation according to increase or decrease of distance. This is true, because the relation between terminal expenses, cost of hauling, and indirect costs varies greatly in different rates. In the first place, rates on low grade commodities as a rule, provide only a small amount for indirect costs, leaving a large part of the rate to cover the regularly increasing cost of hauling. On the other hand, a large part of the rate on high class freight represent indirect costs and the rate is therefore very elastic. Then again, the terminal expenses are a larger per cent. of the L. C. L. than of the C. L. costs. As has already been seen, rates for long distances are very apt to contribute only a small part to indirect costs.

In conclusion, it can, then, he said that while long hauls do not necessarily compel low rates per mile, they often justify them, and much freight, such as coal, lumber, etc., which will not stand high charges can thereby be made to move long distances only by making low rates per mile. This is so because whatever a rate contributes toward indirect costs is a net gain to the railway.

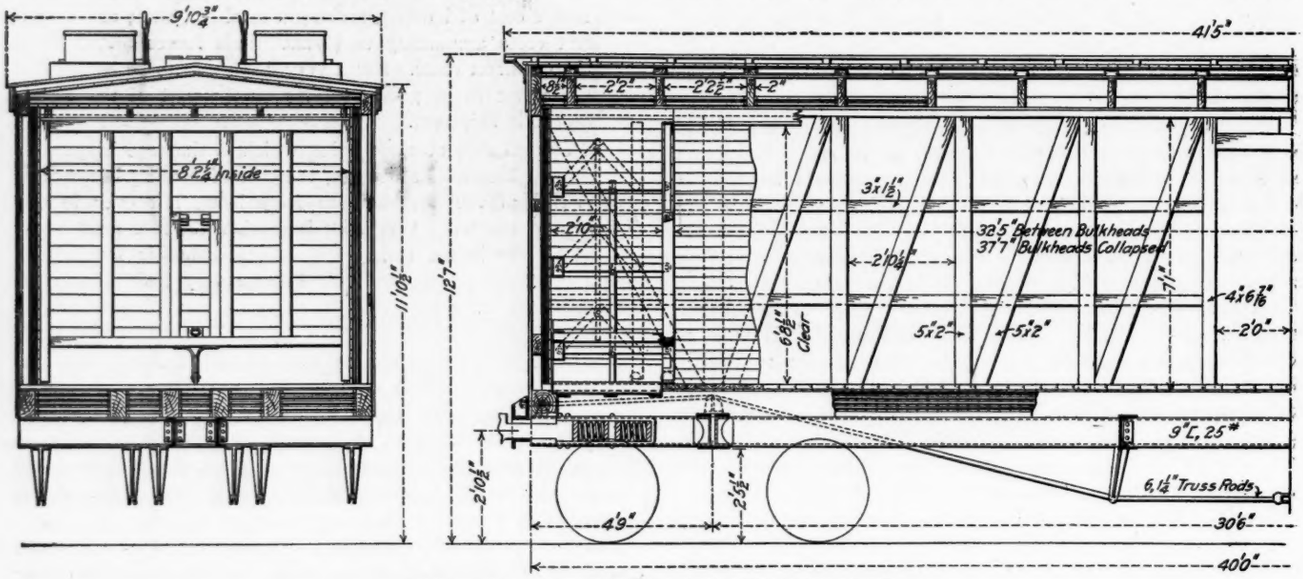
The Brazilian government has extended by 18 months the time specified for the completion of the Itu-Cratheus section of the Sobral Railway.

FORTY-FOOT REFRIGERATOR CAR.

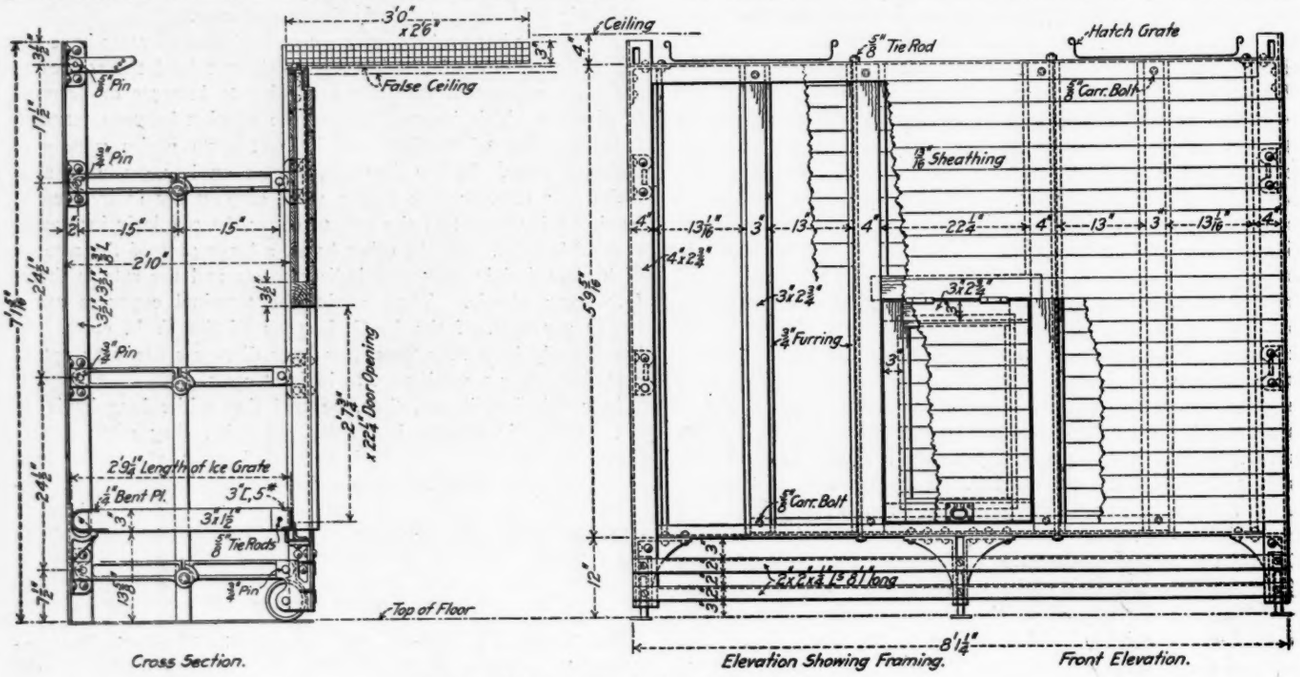
The refrigerator car built by the Union Fibre Company, Winona, Minn., and briefly described in the *Daily Railway Age Gazette* of June 17, 1910, has rendered such good service during the past year on the Harriman and other lines that a more detailed description of its special features are given herewith. The car has four layers of Linofelt insulation, which is one more than is ordinarily used, and is equipped with Brown's collapsible ice tank, which is easily handled by one man; also a weather-proof ventilator and a non-splashing drip pan. The general plan of the car and detailed drawings of these fixtures are here illustrated. In order to determine the value of an extra layer of insulating material this car is equipped with four layers instead of three, and the drawing shows how these four layers are applied. The insulation itself, Linofelt, is made from de-gummed flax fibre, chemically prepared and combed and felted by machinery into a flexible felt ½ in. thick. This flax fibre felt is quilted between two layers of thick waterproof paper, weighing 90 lbs. per 1,100 sq. ft., making the finished quilt ½ in. thick, weighing 42 lbs. per 100 sq. ft. The rows of stitches are 5 in. apart, and the edges are bound to prevent fraying.

By the use of Brown's collapsible ice tank the loading space of the car when not under ice may be increased 16 per cent., the total increase in the length of the loading space when the tanks are collapsed being 5 ft. 2 in. Ordinarily, a refrigerator car is moving under ice only one-fourth of the time, and the remainder of its journeys are made under ventilation or are return trips. On return trips merchandise which does not require icing may be loaded in the car and the value of its full loading space may be utilized. The heavy lines in the general plan of the car show the tank in open position, and the dotted lines show the tank partially collapsed. The bulkhead is held in position by hinged bars which extend from the end wall of the car to the bulkhead and lie close to the side walls. The head rests on the floor on three heavy steel rollers, one on each side and one in the center, and in the middle is a removable door.

To collapse the tank it is first necessary to remove the ice.



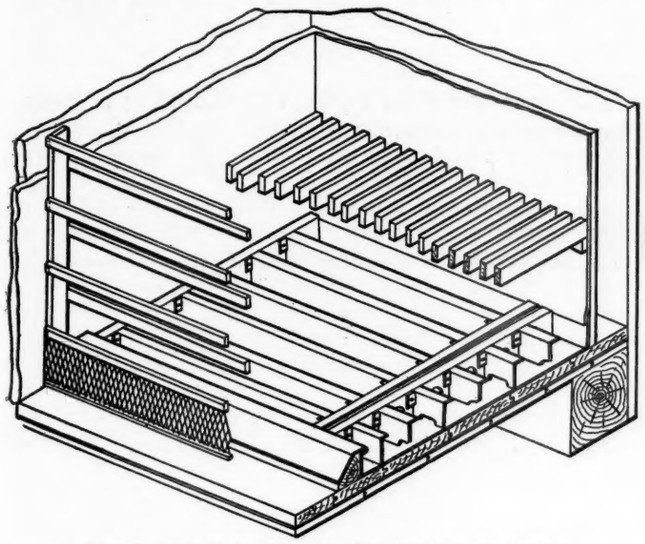
Refrigerator Car Showing Collapsible Ice Tank.



Collapsible Ice Tank for Refrigerator Car.

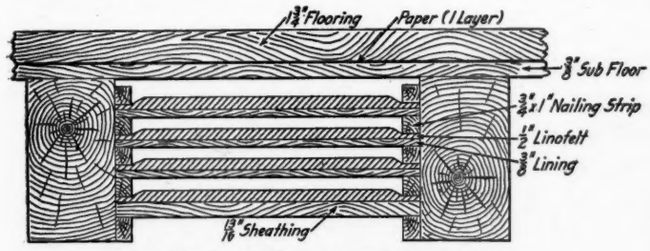
The ice racks are then folded against the back wall and are held by gravity hooks. After lifting the jointed rods of the bulkhead from the inside, to unlock them, the head may be pushed back to the end wall where it is also held by gravity hooks. Everything is so arranged that this change may easily be made by one man.

The non-splashing pans which are used under the ice racks



Non-Splash Drip Pan for Collapsible Ice Tank.

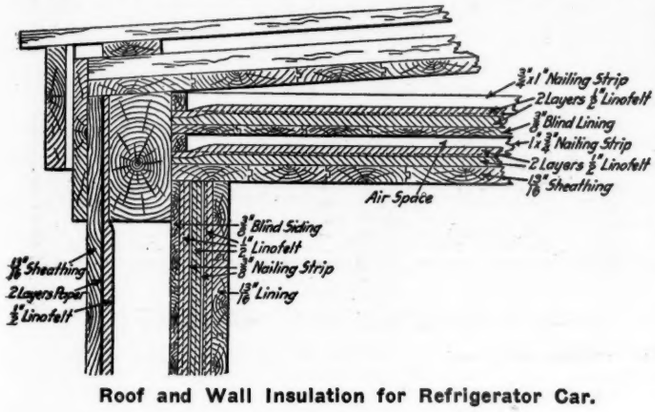
consist of a number of iron gutters parallel to each other. The top of each gutter wall curves over toward the end of the car, and there are holes between each, so that the water may move freely from one to the other on its course to the drain. When the tank is collapsed the iron straps which join the gutters together on top form a level loading surface, thus eliminating



Linofelt Insulation for Refrigerator Car.

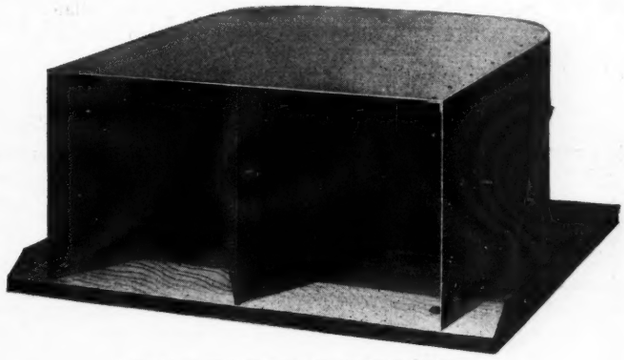
the use of lumber and labor to prepare the loading floor. This drip pan is illustrated in detail.

The car is also fitted with the Leeds ventilators. The ventilator of a refrigerator car should admit a sufficient volume of air and at the same time exclude rain and cinders. It should also be designed so that it can be opened and closed quickly with little effort. The illustration shows the ventilator with the top



Roof and Wall Insulation for Refrigerator Car.

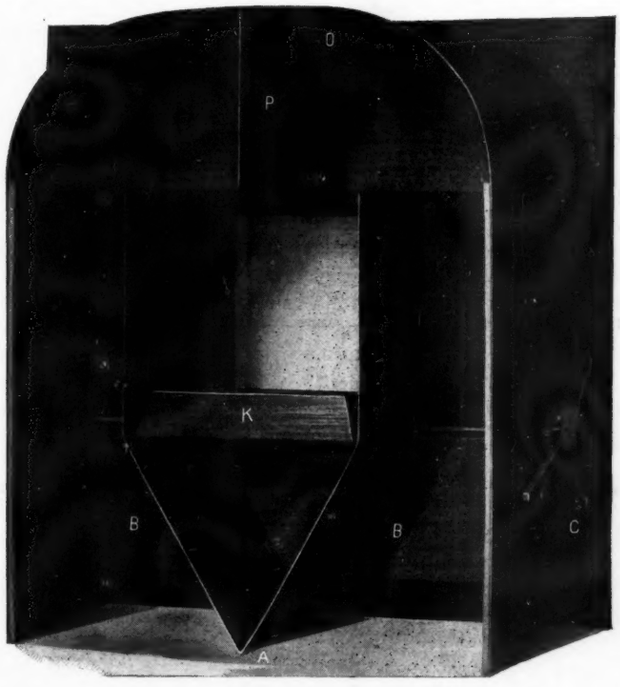
removed, and the observer is supposed to be looking directly down into the ice tank. The plug *K* is operated by a lever at the side, and this may be adjusted at different inclinations by a latch so as to admit larger or smaller volumes of air into the car. The ventilator is faced with the angle pointed in the direction in which the car is moving. This angle *A* deflects the air



Leeds Ventilator for Refrigerator Car.

into passages *BB*, and, striking the partition plate *P*, the current is turned back and downward into the car. The opening *O* in the corner is a drain, and water or cinders naturally flow out through it, as it is the lowest point, and the floor in front of the baffle plates slopes sharply down to the drain.

The entire frame of the ventilator is made of light sheet iron and is bolted directly to the hatch cover and plug, forming a single unit with that apparatus. A hole is cut in the hatch plug directly under the opening in the ventilator, and the closing or opening of this hole is a function of the plug *K*. Four ventilators are used on each car, one over each ice plug. The



Leeds Ventilator With Cover Plate Removed.

object of the Leeds ventilator is to provide a device which will force the air into the car free from dust, cinders and rain. It is particularly valuable in connection with the collapsible tank, but may be applied to solid bulkhead cars or ventilated box cars. It is not necessary to cut the roof of the car to apply the ventilator, because it is combined with the hatch cover; one movement opens the ice box for re-icing, which obviates the necessity of pulling the plugs from the hatches, and there are no mechanical parts to get out of order and require repairs.

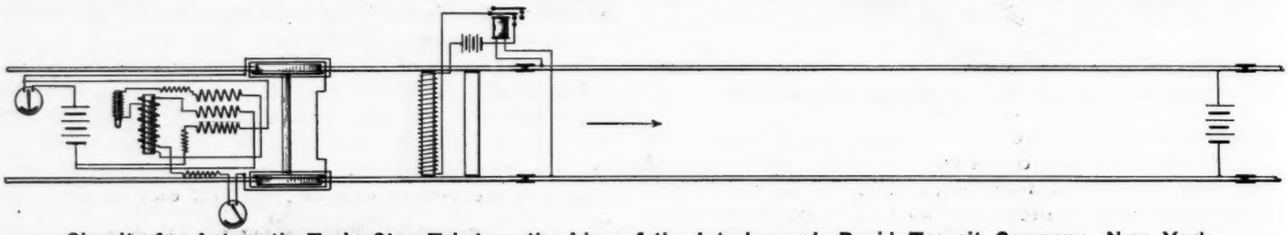
WALDRON'S AUTOMATIC STOP.*

The Railway Signal Association has adopted ten rules which are to be the Mosaic Law which must be followed by the designers of automatic stops and cab signals in the future. As a matter of fact, these ten commandments cover the ground very thoroughly and they can be taken as a safe guide by all inventors who care to enter this field; and if closely followed they will lead such inventors into the promised land, wherein the fruits of their toil will be gathered in harvests of gold. The Block Signal and Train Control Board of the Interstate Commerce Commission, believing in taking a hand in the commandment business, has also laid down ten guiding rules for designers of automatic stops and cab signals to follow. These rules are in substance the same as those prepared by the Railway Signal Association, but the men of this Board, like those men in ancient times who established new religions, made a few departures in form from those of the signal association; but to be sure of followers the cardinal principles had to be left unchanged. Therefore, the Mosaic Law as promulgated by the authorities on automatic stops and cab signals in the railway world demands that all be so constructed that they can be operated on any railway, in any clime, in all seasons, on any right-of-way, at all speeds, and for all classes of traffic; they must at all times conform to the physical conditions of the track which is protected and all parts of the apparatus must be constructed on the closed circuit principle. These rigid requirements practically limit the field to but one class. In that class, the parts of the apparatus on the moving vehicle and the parts of the apparatus along the right-of-way must at all times have an electric and magnetic connection between them which will be immediately influenced by the conditions of the track protected, as well as the conditions of the apparatus itself; inasmuch as the failure of any part of said apparatus must immediately give indication of such failure by applying the brakes on the train or car. The object of this paper is to give a brief description of an automatic train stop and cab signaling system designed to meet the rigid requirements stated.

A careful study was made of all known automatic stops and cab signals to see whether those which had already been developed would meet the requirements of the Railway Signal Association. The strong and the weak points of each system were carefully considered. Each part of each system was carefully considered as to its capabilities of meeting the requirements. It was found that many inventors had perfected splendid devices. Some excelled in one direction, others in other directions. But there seemed to be no one device, nor could a combination be made out of all known devices, which would make one system to fulfill all the requisite characteristics. In all cases, there seemed to be a link which was missing. Some inventors were heading in the right direction, but they stopped before reaching that which they desired to accomplish. They stopped because they had convinced themselves that what they sought after could not be obtained. Several inventors realized that if they could use induced currents they could accomplish that which was desired, the construction of an automatic train stop on the closed circuit principle; but to accomplish these desired results they found there was an air gap which they could not bridge. This air gap appeared so formidable to them that they turned back. It was therefore evident that the air gap between the apparatus on the right-of-way and the apparatus on the moving vehicle would be the starting point for new discoveries. This air gap would have to be bridged by an induced current which would not be interrupted unless there was danger ahead, in order to build up an automatic stop and cab signaling system, on the closed circuit principle. I am glad to say that this gap has been bridged and an automatic stop and cab signaling system has been developed which works on a closed magnetic circuit between the right-of-way and the moving vehicle.

The closed circuit on the track is maintained by locating between the ties and below the rails and insulated therefrom, at the beginning of each block, an electro-magnet and a permanent magnet, the latter superimposed on the other; the electro-magnet receiving its energy from a battery controlled by the track circuit in the block which it protects. This energy amounts to about 2½ watts. When the block ahead is occupied or the track obstructed, the track circuit being interrupted, no energy will pass through this electro-magnet. This magnet would then be in condition for stopping a train; and if a train at that time should attempt to pass by it, the brakes of the train would be applied automatically.*

The part of the apparatus placed on the locomotive or motor car consists, first, of one small coil of wire around each wheel of the front pair of wheels, arranged horizontally. These coils are parallel to the rails and can be four or more inches above the rails, but must be below the car axle. The coils are fastened to the car truck and clear the wheels a sufficient distance to permit free movement of said wheels as well as the convenient change of brake shoes. Next there is a small transformer, an impedance coil, a solenoid coil which is attached to the valve in the train line pipe, and a small battery with an E. M. F. not exceding 100 volts. The battery, transformer, impedance coils, solenoid coil and wheel coils are connected in series on a closed circuit. There are no moving contacts in any portion of this apparatus. In normal operation, current from the battery flows through the transformer, impedance coils, solenoid coil and the wheel coils in series, then back to the battery. The solenoid coil being thus energized, its armature is attracted and the valve in the train line pipe remains closed. When a locomotive or car suitably equipped passes over one of the magnets between the rails, and the track ahead is clear for it to proceed, the electric energy in the track coil (which is immediately under the permanent magnet) counteracts the effective force which the permanent magnet would exert on the apparatus on the vehicle, to the extent that the energy in the solenoid coil on the moving vehicle is not opposed, but rather is assisted. The armature of the solenoid coil is therefore held in the attracted position; the brakes are not applied. But when the track ahead is occupied, the track circuit shunted, and the track coil de-energized, there is nothing to oppose the force exerted by the permanent magnet. If an engine should then pass, the permanent magnet would generate in the wheel-coil circuit a flux tending to change the potential in that circuit. This energy from the permanent magnet is in opposition to the current flow in the apparatus on the vehicle. This opposition is strong enough to counteract the holding effect



Circuits for Automatic Train Stop Tried on the Line of the Interborough Rapid Transit Company, New York.

*A paper read before the Railway Signal Association, New York City, June 14, 1911, by J. M. Waldron, Signal Engineer, Interborough Rapid Transit Company.

*The use of an overlap, which would be a feature of this arrangement in regular service, would require additional connections, not shown in the drawing.—Editor.

which the battery on the vehicle exerts on the armature of the solenoid coil, with the result that the coil is de-energized, its armature falls and the air brakes are applied.

This counter electro-motive force is alternating, with its frequency determined by the speed at which the train or car is moving. After this apparatus is once regulated to permit all movements being made over the track magnets when the speed of such movements do not exceed, say, five miles an hour, it remains permanently at that adjustment. There is an efficient margin of 50 per cent. provided on both sides of that which is considered the best working condition of the apparatus. At any speed exceeding 5 miles an hour, the operation is positive. The higher the speed at which the train is traveling, the more propronounced is the effect on the solenoid coil which controls the air brake valve. The current consumption of the apparatus on the locomotive does not exceed one watt.

The batteries for supplying current on the train or car are small. In fact, a few cells of dry battery would be sufficient to make a round trip from New York to Chicago and have considerable energy left. The parts of the apparatus on the train are quite small. In fact, that which has been constructed and which was used in making experiments, is contained in a box 12 in, long by 12 in. wide by 5 in. deep. These dimensions can be materially reduced by careful designing. As the apparatus is designed, steel bridges, steel viaducts or grade crossings will have no effect whatever upon its correct working. Tests covering a period of several months have been made with a motor car equipped with this device, with the desire to locate any defects which might be in it, but so far, I am very glad to say results have been entirely satisfactory.

ORGANIZATION OF A TRAIN DESPATCHER'S OFFICE.

BY STEPHEN H. BROWN,
Great Northern Railway, Spokane, Wash.

A great deal has been said and written about the train despatcher and his duties. That the work of the despatcher is of great importance cannot, of course, be denied. That the duties are irksome is true only where they are made irksome. And that they become irksome is, perhaps, due more to carelessness than otherwise.

In the Standard Code may be found various rules for the government of division officers and employees. Some managements require that the chief train despatcher report to the trainmaster; others that he be under the direct control of the superintendent. Many different views are entertained as to the wisdom of having the trainmaster exercise supervision over the train despatcher's office, and it seems impossible to harmonize the conflicting opinions. It has been said in the columns of the *Railway Age Gazette* that competent men avoided taking up the responsibility of the chief despatcher's office, and the reason here stated was, I believe, one of the chief objections advanced. As a matter of fact, the duties exacted of a chief despatcher may be made to coincide with those of other interests of the division in a way that will make the office attractive to its incumbent and of immense value to the division. It has been my observation that many chief despatchers enmesh themselves in a labyrinth of red tape from under which it is hard to extricate themselves, and this is another reason so many men prefer to work an eight-hour trick rather than risk being buried under the volume of work that appears to beset the man under whose direction they labor.

In the organization of a train despatcher's office, particular attention should be given to the method of filing the important papers that demand attention.

The train sheet, which should properly record the operations of the district represented by it, ought to be closely scrutinized by train despatchers as well as the chief despatcher in order to see that it is made complete before being filed. At the end of each month, train sheets should be fastened together securely on one end, and with them should be bound a copy of the current time table. The time table will be of special benefit in the years that follow in settling quickly questions as to the time at which trains were due at the different stations on the division. A very satisfactory method of binding train sheets is to secure them with brass paper fasteners, the ends of which after being firmly hammered flat, are covered with a stiff piece of paper, large enough to cover the points.

As the clerical force of the chief despatcher's office is seldom equal to the requirements of the business, the filing system must be at once comprehensive and simple. Select the important subjects, and under these headings file all business pertaining to the subjects indicated by the heading. Fifteen or twenty pigeon holes will readily accommodate the business in this way, and will permit of a ready reference to the files at all times. At the end of the month, the pigeon holes should be emptied and the contents of each placed in a wrapper marked with the subject it represents.

Car tracing files should be arranged so that they can be readily referred to. A simple method of doing this is to have numbers ending in 1 kept together, likewise those ending in 2, and so on down the line to those ending in 0. This arrangement will answer satisfactorily the purposes of the ordinary despatching office.

The pigeon holes should be about six inches wide, three or four inches high and eight and one half inches deep. In a pigeon hole of this size, ordinary letter paper, folded horizontally through the center, and regular telegraph forms will lie flat. It would be quite impossible to name a list of subjects for everybody, but the following will usually apply to train despatchers' offices:

Passenger equipment	Accidents
Special train service	Yard reports
Passenger equipment—bad order	Work train service
Engines	Cars used in work service
Engine failures	Live stock
Engine reports	Perishable freight
Company coal	Time freight
Company sand	Delayed business
Company wood	Situation reports
Operators	Car Situation reports
Operators' applications	Miscellaneous

In filing matter taken from these pigeon holes at the end of the month, it is only necessary to use a simple wrapper upon which the subject and the month may be written. These records may be kept in the office for a reasonable time, where they will be readily accessible, after which they can be stored in record rooms in such a way that they can be reached with no other delay than that necessary to get to them and untie the string. For the car tracing file, the pigeon holes should be the same width and depth, and each of the ten necessary for the car tracers should be divided by a horizontal shelf a couple of inches from the top above which the live tracers should be kept and the discard filed below for reference. If proper care be given to the marking of this business, there is no reason why a record five or ten years old should not be located as easily as one for the current month.

Frequently the argument is advanced that a chief despatcher is too high priced a man to give attention to such details of his office as looking after the files. This does not appear to me to be good logic. If the records are worth keeping at all, they are worth keeping in such a fashion that they may be used whenever needed to settle cases of doubt. Message files ought to be as closely supervised as are the other records in order that the business of each day shall be kept by itself and in a way that will make it possible to refer to it quickly when necessary.

If a man in charge of a train despatcher's office will deal with absolute fairness with every interest with which he comes in contact and does not permit personal feeling to enter into any of his business relations, there is no reason in the world why the office of chief despatcher should not be made one of the most attractive on a railway, nor is there any reason why the chief despatcher himself should not command the respect and support of his superiors as well as of his subordinates.

An engine was to be moved to a point 100 miles distant from the shops for service on a branch, this engine to be exchanged for one that had been used in its place while repairs were being made. In order to make the change, the chief despatcher suggested to the master mechanic that the engine be used on a local passenger train whose terminal was the point from which the branch diverged. The master mechanic objected to the arrange-

ment, saying that he feared the engine might lose a lot of time. But the chief despatcher put the engine on the passenger train, and the result was as the master mechanic had predicted, the delay being somewhat greater than either had anticipated. The chief despatcher, immediately after the performance of the engine became known to him, wrote a letter to the superintendent, advising him of the facts as stated above, and wound up his letter with a paragraph stating that the intent of the letter was to take from the shoulders of every other individual interested, except himself, all responsibility for the movement. A carbon copy of this letter was addressed to the master mechanic and to the roundhouse foreman for their information. The incident was closed without further correspondence and the mechanical department officers thereupon reached the conviction, if they had not previously done so, that the man responsible for the combination was, above everything else, fair.

Another chief despatcher had in his force two men, one of whom was his brother-in-law, and the other a man between whom and himself the choice had fallen at the time of his appointment. On the division over whose destinies he presided, an allowance of four days every two months was made for despatchers to learn the road. Mr. Brother-in-law spent one of his periods in visiting his family—and was paid in full. The other fellow spent a portion of one of his four days in a business trip which could have been made without lying off; but by keeping on the road night and day for the rest of the time, completed his tour of the division within the prescribed four days. From the pay check one day was deducted. In this case the chief despatcher established a reputation for duplicity that is characteristic of the unfair man.

Train despatchers should be given the benefit of all information in the way of tonnage statistics, overtime statements and performance sheets that reach the chief despatcher, and their interest and enthusiasm invited, to the end that everyone will feel a personal pleasure in producing commendable results.

A convenient and effective method of keeping in touch with the engine situation on the division is that used by the line with which it is my good fortune to be identified. Simple wooden plugs are used to represent the engines; white for freight and pink for passenger engines.

These plugs have ¾ in. faces to carry the number and ⅛ in. points to fit holes of corresponding diameter in the board.

Headings of Engine Board.

Spokane Division.

		In Service.					Out of Service.									
			Freight.				In Shops.				Waiting Shop Entry.					
							Pass.		Freight.					Stored.		
Kal. Div.	Cas. Div.	Pass.	Through	Local	Switch	Work	Light Repairs	Heavy Repairs	Light Repairs	Heavy Repairs	Pass.	Freight	Switch	Pass.	Freight	Switch
KP	PG	A	B	C	D	F	H	I	J	K	M	N	O	R	S	U
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	.....	..	..	..	..	..	..	..	..	..	..	..	..	..

The headings speak for themselves. Each Friday a check of the board is made and forwarded to the proper officers of the road. A daily check is made showing changes. This also goes to interested officers, the general superintendent transportation, St. Paul; the superintendent motive power, St. Paul; the general master mechanic, Spokane.

A train despatching office usually is a place of activity, and it is well to be busy. Work is in a class by itself. Work, however, doesn't necessarily mean drudgery. *Be busy but not a busybody,* might be suggested as a good motto for the train despatcher—and others. Reading on duty, for pleasure, is not recommended as a proper pursuit. Studying rules when otherwise unoccupied or keeping in line in one way and another with railway affairs results in mutual benefit to the railway and the employee.

The writer gets out of life an immense amount of good fellowship and no small amount of fun. If anything is to be said that ought to be said—even if it is unpleasant to say—out with it and be done. Then at once get back to good cheer and profit by the lesson—if there be a lesson.

Don't sulk. Don't nag. Don't dismiss anybody (or any subject, that ought not to be dismissed.

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

IV.

Tucson, Arizona, April 29, 1911.

My Dear Boy: After the commission kicked for rest, the general manager tied up in his caboose. Nobody was allowed to run around him and he was marked up first out the following morning. The commission not having any agreement about initial overtime, the attorney acting as yardmaster handed him a switch list and told him to dig out these loads:

Question: How many letters a day do you write?

Answer: I don't know, a great many.

Q. How many a day go out of your office?

A. I can't state exactly, probably a hundred or more.

Q. Then you do not see them all?

A. No, that would be impossible in such a large office.

Q. Does the chief clerk see them all?

A. I think he does.

Q. You are not sure then?

A. No, not entirely. I have had no complaints about that.

Q. Is the only way you know about how things are going to have a complaint come in?

A. Not exactly. I try to keep ahead of the game.

Q. Are the offices of your subordinates run in this same haphazard manner?

A. I do not admit that it is haphazard. The general method is the same.

Q. Who is in charge of the distribution of cars?

A. My superintendent of transportation.

Q. To whom are his instructions given?

A. To the division superintendents.

Q. Does he give his instructions personally?

A. The important instructions he gives personally. Of course he cannot do it all alone. You understand that his department deals with individual cars and has an enormous amount of detail.

Q. How many men are authorized to sign his name and initials?

A. I don't know.

Q. Then you do not regard this as an important matter?

A. Not as important as some others. That is a matter for which the superintendent of transportation is responsible. I look to him.

Q. Do you think every man charged with duties should be allowed to select his own type of organization and decide as to his own methods?

A. As far as possible, yes.

Q. Then why not let each conductor make his own train rules, and each station agent keep his own kind of accounts?

A. Because confusion would result.

Q. Is it not a fact that on most American railways six or eight clerks are signing the name or initials of the superintendent of transportation?

A. I don't know; very likely.

Q. Does not a similar condition exist in a smaller degree in most railway offices.

A. Yes sir, that is the system.

Q. Then who are running the offices, the officials or the clerks?

A. I always supposed the officials. You see we could not afford so many officials.

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Q. Has it ever occurred to you that by having more officials you might get along with fewer clerks?

A. No, sir.

Q. Who sign for the train orders on your road?

A. Our conductors.

Q. Have not conductors and operators been discharged for signing each other's names?

A. Yes, sir. We must maintain discipline. If the train orders are not respected, accidents will result.

Q. Then you have one policy for one class of employees, and allow your officials and clerks to be a law unto themselves?

A. Not exactly. As I said before we cannot afford so many officials.

Q. Whose initials are signed to your train orders?

A. The superintendent's.

Q. Why?

A. Because it has always been that way on our road. It makes the order stronger.

Q. If initials make an order stronger, why not sign yours, or the president's or God Almighty's?

A. That would be ridiculous.

Q. Then it is not ridiculous to sign the superintendent's initials when he is at home or in bed?

A. No, that is different. We wish to emphasize the fact that the superintendent is in charge of the division.

Q. Then why not put the superintendent's photograph on all the orders? Would that strengthen him with the men?

A. No, of course not.

Q. You have been talking about the superintendent; is he the same as the superintendent of motive power?

A. No, you do not quite understand. The superintendent has charge of a division and the superintendent of motive power, like the superintendent of transportation, has charge of a department.

Q. Then the word superintendent doesn't always mean the same thing?

A. No, sir, but no confusion results. You see the heads of departments are general officers while the superintendent is a division officer.

Q. Which superintendent?

A. The division superintendent.

Q. Is it not a fact that on some roads there is a question as to which has authority in certain matters, the division superintendent or the superintendent of motive power?

A. I believe so, but we do not have any such trouble.

Q. (Producing copies of letters furnished by discharged office employee.) Does not this correspondence indicate a heated difference of opinion between your superintendent of motive power and a division superintendent which had to be settled by you?

A. Oh, yes; I recall, I had forgotten that. That will not happen again.

Q. What guaranty have you against similar friction?

A. I have that all straightened out. Everybody is lined up and understands that I insist upon harmony with a big H.

Q. To prevent confusion and, therefore, to save money why not make titles sufficiently distinctive in rank to prevent conflict of authority?

A. We have not thought it necessary. I do not go as much on titles as some people. The old fashioned way is good enough for me. A rose by any other name would smell as sweet.

Q. How, then, if you ordered roses for a funeral, would you guard against the corpse being handed lemons?

A. By sending a note or a card.

Q. Signed by your chief clerk?

A. No, sir.

Q. Do you think it is honest to have your chief clerk signing your name while you are away at this hearing?

A. There is no intent to deceive.

Q. Do you not unconsciously try to convey the idea that you are in one place when you are really in another, or that you are acting when it is really an entirely different man who is taking action?

A. Perhaps so. I had never looked at it in that way. It is a generally recognized custom.

Q. You do not seem to regard the office part as very important, as you permit a lot of clerks to take final action all day long.

A. The office is not as important as the road. I try to give the most attention to the important matters on the road.

Q. You feel that by doing so the office will in a large measure take care of itself?

A. That is it exactly.

Q. Do you not think that most railway administrative offices have grown too large to take care of themselves?

A. You see, we keep in close touch with our offices on a railway, because when away we have a telegraph or telephone wire at our command.

Q. What good does a wire do you if you are tied up in a hearing or a conference for two or three hours at a time?

A. I fear that I have not made clear to you just how valuable a man I have trained into a chief clerk.

Q. I fear that you have not. You seem to believe the old system is all right. Do you think the last word has been said or that your road has hit upon the best system?

A. The last word on these important subjects will never be said, but we have been getting along very well.

* * * *

I shall not continue further in this letter the catechismal method, unless you accuse me of forgetting that you long ago graduated from the kindergarten. So you did; but when in doubt get back to early methods. After reading recently an article on scientific management, I had to recall my catechism to feel certain that handling pig iron is not the chief end of man. We all, you and I included, sometimes show up smaller than we really are, because we seem to think only in the narrow terms of the things to which we are closest. It once fell to the lot of a young official to escort over his road some of its directors, bankers from New York. Being an enthusiast for his section of country, being an operating man with an instinct for developing traffic, he talked of progress, of the economic and social welfare of the people. When he spoke of sugar planting, or of cotton growing, of blooded stock and dairy yield, the bankers asked, "How much does it cost to raise an acre?" or "What percentage of profit do they make?" He returned from the trip feeling that money must be the god, that his directors could think only in terms of dollars and cents. It dampened his ardor for a time. Then he was so fortunate as to ride for a few days with some of the really big modern bankers. He found himself listening with open mouth to their wonderful expression of practical sociological truths. He marveled at their recognition of the human element, and he understood better why the board sometimes turned down his recommendations. His only lament was that he could not see more of them. There, my boy, is the great misfortune, there is a problem to be solved. There is too much Boston, New York, Philadelphia and Chicago. The directors seem too far away. It is a step forward that the overlords of transportation are bankers who have won their way rather than hereditary descendants of once reigning families. Some method must be evolved to make for more elastic control. Annual inspection trips will not overcome that rigidity in administration at which the public chafes and from which it seeks relief in drastic laws. An interesting and hopeful phase of present development is the election to directorates of trained railway executives like L. F. Loree and H. I. Miller. The professionally equipped railway director is a desirable evolution. Supply always follows demand, and the broad solution will be a composite made up of many elements of progress which perhaps have not yet unfolded themselves to any of us.

It is a great game, this transportation business. The more

you study it, however, the more you discover that it is amenable to the same underlying principles on which rest the great and small activities of the human race. Like all professions it has its distinct technique. Like all professions it suffers from the inborn tendency of human nature to segregate itself behind an exaggerated class consciousness. "We are a little different," or "You do not quite understand our peculiar local conditions," are the arguments with which ultra-conservatism has opposed progress in all ages, are the obstacles which make so interesting all real contests for principle.

I make no apologies for taking you in this letter from the witness stand of the west to the financial chancelleries of the east. When both the banker director and the general manager learn that signatures on letters and train orders must be as sacred as when signed to bank checks, we shall be winning back a little of that old time sense of personal responsibility which is so needed for improving composite efficiency today. What better epitaph could any man desire than this, "He helped to teach corporations to remember that lasting composite strength comes only from intelligent recognition of individual manhood?"

Affectionately, your own,

D. A. D.

THE RAILWAY SIGNAL ASSOCIATION.

The regular meeting of this association was held in New York City, at the Hotel Astor, on Tuesday and Wednesday of this week, with an attendance of about 150. Two meetings were held each day, with President C. E. Denney in the chair.

Mr. Rudd, chairman of Committee No. 1 on Uniform Signaling, spoke of the recent report of the Committee of the American Railway Association on signal indications, and said that his committee would probably soon be able to submit a report in which all the members will concur. The Sub-Committee on Symbols, of Mr. Rudd's committee, J. C. Mock, chairman, presented such changes as have been made in the proposed standard symbols. Suggestions for further changes were offered by members, and the standard symbols will be presented by the committee in October for adoption. Committees 2, 3 and 4 submitted progress reports, that of No. 4 including specifications for hard fiber, and impregnation treatment of coils, and changes in the specifications for channel pins. Some changes in the standard cell were offered by Subcommittee 4 of Committee No. 4 on Automatic Block. Specifications for concrete were submitted by the chairmen of Committees 2, 3 and 4. It was suggested that these should be made to conform more closely to the specifications for concrete of the American Railway Engineering Association.

At Wednesday's meeting the secretary read Mr. Sparrow's paper on Substitutes for Wood Trunking. In the discussion some difference of opinion were brought out as to details of construction of conduits, and some interesting comparisons of the life and applications of clay conduit and other types.

The paper on Apparatus for Charging Storage Batteries was read and discussed at the afternoon meeting.

Committees 10, 11, 12 and the special committees on Storage Batteries, on Promotion of Signaling Education, and on the Recording of Signal Failures, presented progress reports. Good progress on the Manual of Recommended Practice is being made and a full report is expected in October.

On Tuesday, J. M. Waldron, read a paper describing a new automatic train stop, which he has installed on his road—the Interborough Rapid Transit Company, New York City. This paper will be found in another column. It was received with marked interest, and Mr. Waldron answered numerous questions.

The committee reports presented at this meeting, though mostly informal were fully and freely discussed, and many helpful suggestions were made for the benefit of the committees. The plan of continuing the meeting through two days proved a good one, as it gave time for proper consideration of the reports, which contained much valuable detail.

THE COMMUNIPAW EXPLOSION.

In a special report presented at the meeting of the American Railway Association in New York City, May 17, Col. B. W. Dunn, chief inspector of the Bureau of Explosives, described the circumstances of the explosion which occurred at the Communipaw dock of the Central of New Jersey on February 1 last, when 25 persons were killed and great damage done, and the whole of the lower part of New York City shaken. (Reported in the *Railway Age Gazette*, February 3, p. 259.) The explosion occurred in connection with the unloading of boxes of dynamite from a car which had come from the Kenvil plant of the Du Pont Powder Company, and the car and its lading had been inspected by one of the agents of the bureau. Some of the 670 boxes in the car were unloaded January 26 and again others on January 28. On February 1, men from the steamer Katherine W. started to unload the remainder, consisting of 300 boxes of 75 per cent. Forcite gelatin dynamite, each box containing 50 lbs. From a Polish laborer who was looking for work on the dock that day and who was hired to help in the unloading, but who, after a few minutes, left the work because he thought it was not being conducted with proper regard for safety, Col. Dunn learned that the boxes were pushed down an inclined plank 1 ft. wide and 14 ft. long with such lack of care that they sometimes turned partly around because of the roughness of the upper surface of the plank, although no box fell off the plank during the time that this man was at work. One of the men in the car wanted a hook. The captain refused it because the use of a hook would be dangerous, but the man insisted on having one because it was too cold to take off his gloves and a small hook was then passed to him. The Pole, after protesting, left the work because the captain insisted on speed in handling the boxes, and he was vigorously ridiculed by the crew for leaving. The explosion occurred about 10 or 15 minutes after he had left the place.

Col. Dunn concludes that there was no explosion inside the freight car and that the whole trouble started on the deck of the boat, which contained, besides the dynamite, 10,000 lbs. of black powder and two cases of blastings caps. The captain of the steamer was in charge of the unloading. There is nothing to show that he did not follow the practice that had been used on this boat for years. The railway company received, transported and delivered the car to the consignee strictly in accordance with the federal regulations, but prompt removal by the consignee, which the regulations require, was not enforced. This rule is being violated frequently at many points in the United States and a railway has no effective power to enforce it. The only recourse is to apply to the courts. The present explosion, however, was not due to failure to observe this rule. The gelatin dynamite was frozen at the time. Adjacent to the car which was demolished was another car containing 2,000 lbs. of dynamite which did not explode. The cause of the explosion cannot be stated definitely. Fragments of the boiler of the vessel were widely scattered and it is possible that the explosion of this boiler caused the explosion of the dynamite. The evidence, however, is conflicting.

The crew of the vessel handled the dynamite without proper care, but they paid the penalty with their lives, and Col. Dunn goes on to discuss the defects of the system of which they were the victims. For years the Katherine W. has been transporting explosives around New York harbor without efficient regulation, and when the railways began to improve their methods of handling explosives, four years ago, they tried to extend the improvement to water transportation in the harbor, but did not succeed in doing so. The Katherine W., carrying explosives, apparently has been navigated in times of dense fogs as freely as though it were an ordinary barge with non-explosive freight. Col. Dunn recommends that the strict regulations now in effect on the railways be made effective in the harbor. Incidentally, he calls attention to the fact that some of the states have established regulations somewhat inconsistent with those of the federal government.

SAFETY ON THE ILLINOIS CENTRAL.

Vice-president W. L. Park, of the Illinois Central, reports that for the first year of the operation of the new methods in discipline, established by him in May, 1910, the number of train accidents has been reduced, as compared with the preceding year, almost 25 per cent., while the damage to property has been reduced almost 50 per cent. The total property damage, by train accidents, in the year ending April 30, 1910, was $404,431; while in the year which has just closed it was $204,024. Mr. Park divides the train accidents into two classes, avoidable and unavoidable, and the total of accidents, of damage and of persons killed and injured in the two classes are as follows:

Train Accidents—Illinois Central and Controlled Lines.

	Year ending April 30, 1911.	Year ending April 30, 1910.	Decrease.
Accidents, avoidable	193	232	39
Damage to property	$133,654	$241,759	$108,105
Persons killed	6	13	7
Persons injured	75	439	364
Accidents, unavoidable	75	124	49
Damage to property	$70,370	$162,672	$92,302
Persons killed	4	3	(Inc.) 1
Persons injured	48	70	31

This is a highly creditable record. A comparison of the number of accidents or the numbers of persons killed or injured on one road for one year could hardly be accepted as conclusive, but the item of money damages, which is affected by every accident of any consequence, is a pretty fair criterion; and in this statement before us makes a remarkable showing. Moreover, this great improvement in safety has not been brought about by any important lessening of dangerous environment or conditions. The number of trains run increased both in passenger and in freight service; and the total train miles increased 2.87 per cent.; engine miles increased a slightly smaller per cent. and car miles, both freight and passenger, increased about 4 per cent., showing improved economy in both services; and this improvement is shown still further by the statement that the freight ton mileage increased from 20,353.7 millions to 21,588.7 millions, or about 6 per cent. As already observed, the records of the numbers of accidents and of casualties must be taken for longer periods if one is to attempt to draw from them any conclusion as to what improvement has been made. This is shown by some of the figures for individual months. For example, in July the number of persons injured in avoidable accidents fell off from 43 to 0, but the property damage fell off only about 50 per cent. In November the number of persons killed increased from 0 to 2, while the record of injured decreased from 13 to 1; but the property damage increased from $16,469 to $34,950. Unavoidable accidents show similar contrasts. In April the number of these was eight in both years; but the property damage fell off from $58,784 to $6.675; while the casualties in the later year were zero in both columns.

Mr. Park has made these statistics the subject of a circular to officers and employees, commending them for the efforts that they have made toward bringing about such gratifying results. Besides the surprise checking and other efficiency tests introduced by Mr. Park, two other prominent measures were adopted: First, a modification of record discipline; and second the granting of annual passes to the older employees. "Brown's Discipline" has been in effect on the Illinois Central since 1902, but in revising the regulations in May, 1910, Mr. Park systematized the cancellation of demerits as follows: A reprimand is cancelled by a clear record of three months; five demerits by a clear record of six months; ten by nine months; thirty by one year; and sixty by eighteen months. The annual passes to enginemen, firemen, conductors, trainmen, agents and operators are given as follows:

Five to 10 years' service: Good on division on which employed.
Ten to 15 years' service: Good on grand division on which employed.
Fifteen or more years' service: Good on system; also in favor of wife.
Pensioned employees and their wives: Good on system.

After this year the granting of these passes will depend on the employee being able to show a clear record.

MIKADO AND PACIFIC TYPE LOCOMOTIVES; BALTIMORE & OHIO.

An order for 50 locomotives was recently completed for the Baltimore & Ohio by the Baldwin Locomotive Works. Forty were Mikado locomotives, while the remaining 10 were of the Pacific type. These engines are the heaviest of their types thus far completed by the builders, and are made as nearly interchangeable as possible. The following parts are interchangeable: Boilers, cylinders and heads, pistons and rods, crossheads, piston valves, throttles, dry pipes and steam pipes, smoke stacks, smoke-box fittings, grates, trailer trucks, driving boxes, shoes and wedges, driving springs, cabs, back foot plates; throttle and reverse levers; cast steel cross ties; furnace bearers; sand boxes, bells and headlights, and various smaller details and fittings.

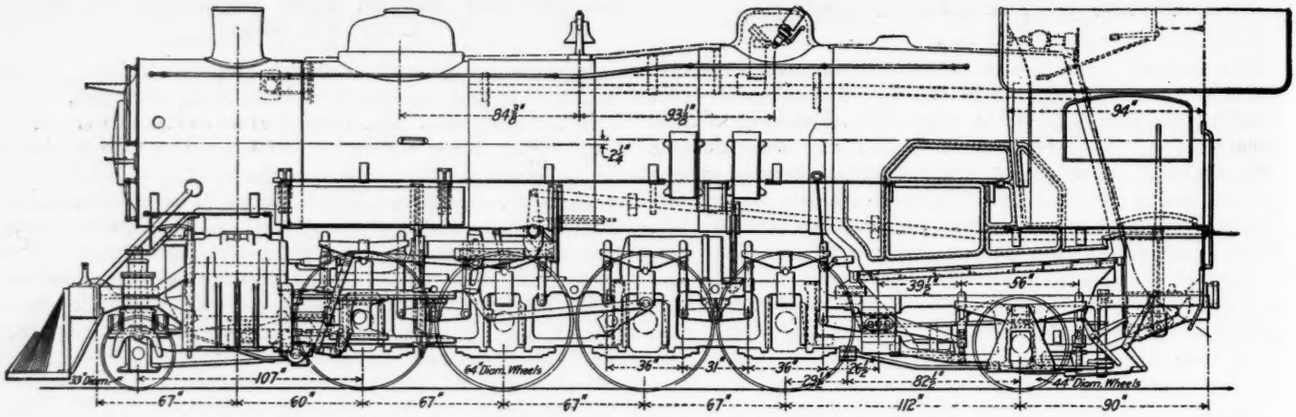
The cylinders of these locomotives are 24 in. x 32 in. and the steam pressure is 205 lbs. The tractive effort developed by the Pacific type is 43,400 lbs., which gives a factor of adhesion of 3.84; the Mikado develops 50,200 lbs., giving a factor of adhesion of 4.37. The boiler is of the wagon-top type, 78 in. in diameter at the front end and 86 13-16 in. in diameter at the dome ring. The dome is formed of a single piece of flanged steel plate. The longitudinal seams are welded at the ends and have diamond welt strips inside. The fire-box is radially stayed and flexible staybolts are freely used, especially in the throat and upper corners of the sides. The mud ring is supported on sliding shoes in front and a buckle plate at the rear. Surge plates are placed in the boiler barrel at the water level, one immediately in front of the fire-box, and the other about 7 ft. back of the front tube sheet. The injectors are placed on the back head and discharge into an internal pipe which delivers the feed near the front end of the barrel.

The steam distribution in both engines is controlled by inside admission piston valves 14 in. in diameter. The valves are driven by the Walschaert gear, and are set with a lead of ¼ in. The cylinder castings are arranged for double frame rails 5 in. wide, and are keyed to the frames at the front only. Each cylinder casting is secured to the corresponding bottom rail by 6 horizontal and 6 vertical bolts, and to the top rail by 4 vertical bolts. The castings are built with heavy walls, and are secured to the smoke box and to each other by double rows of 1¼-in. bolts.

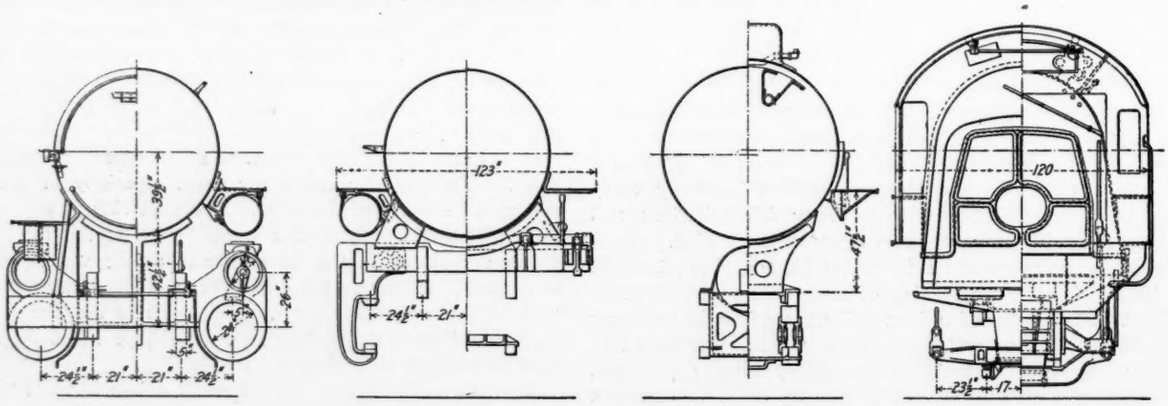
The frame construction is most substantial throughout, the main frames being 5 in. wide, and the separate rear sections 3½ in. wide. The main and rear driving pedestals in both classes are braced transversely by deep steel castings, which are interchangeable on the two types of locomotives. The top front rail on the Mikado is of cast steel and is formed in one piece with a vertical lug, to which the guide bearer is bolted, while on the Pacific type the guide bearer is secured to the frames by separate cast steel knees. The shoes and wedges on both locomotives are of cast iron lined with brass, and the driving boxes have brass faces which bear against the cast steel wheel centers.

The trailing truck used in both designs is of the Hodges type, with outside journals, its general design being shown in the accompanying illustration. A feature of this truck, as used in the present case, is a centering spring, consisting of 8 plates, each measuring 4 in. x ⅜ in. This spring is placed in a vertical position, being riveted at the top to a casting which spans the frames; it is held at the bottom in a clamp which is bolted to the truck frame. The truck spring links are jointed, to take up the side swing when the engine is curving. Waterscoops, operated by compressed air, are used on 25 of the freight tenders and provision is made for subsequently applying them to the tenders of the passenger locomotives, if desired. The center sills are 15-in. channels and the side sills 10-in. channels, with wood bumpers front and back. The tenders for the Pacific type locomotives have equalized trucks, while the trucks used under the freight tenders have one-piece cast steel side frames. Rolled steel tender wheels are used in both cases.

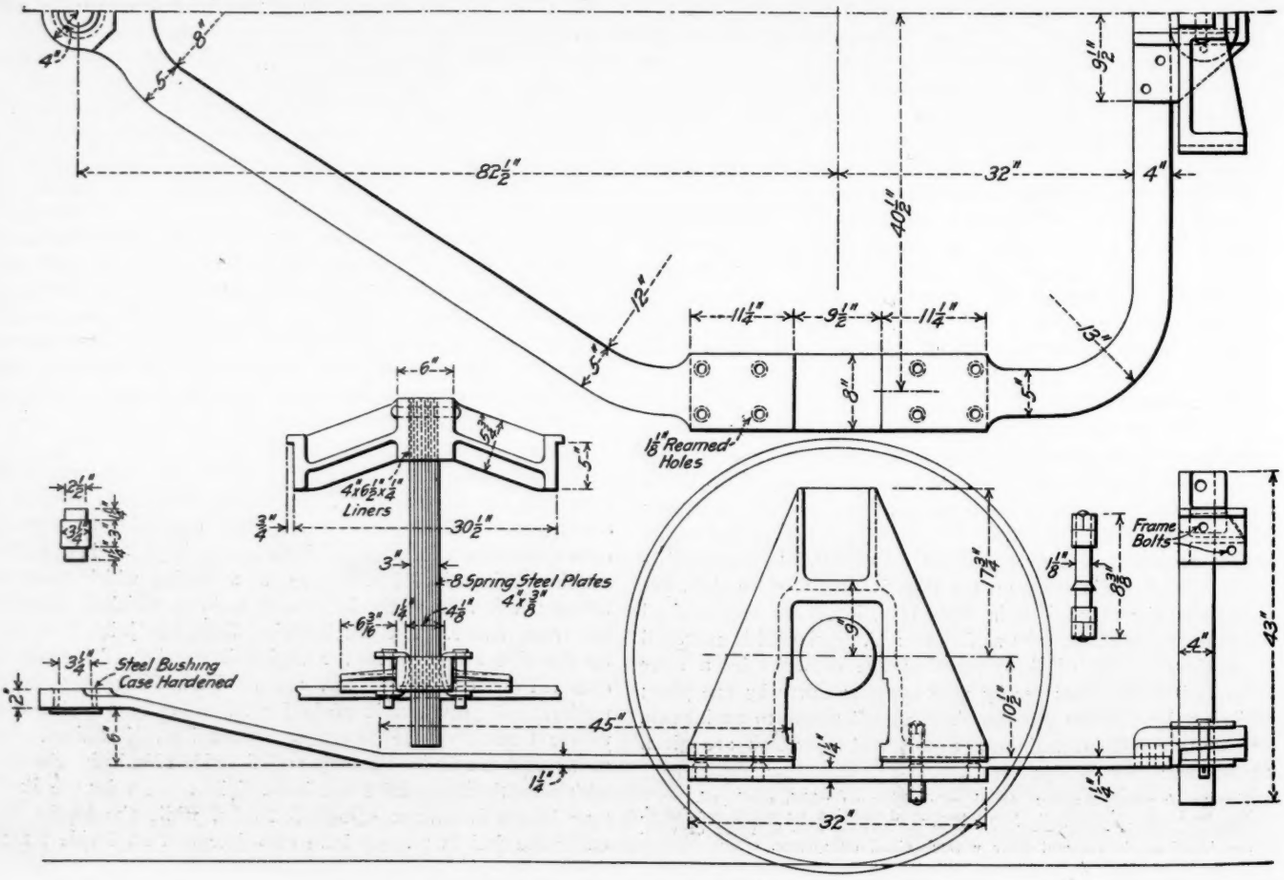
These engines rank among the most powerful single expan-



Heavy Mikado Locomotive for the Baltimore & Ohio.



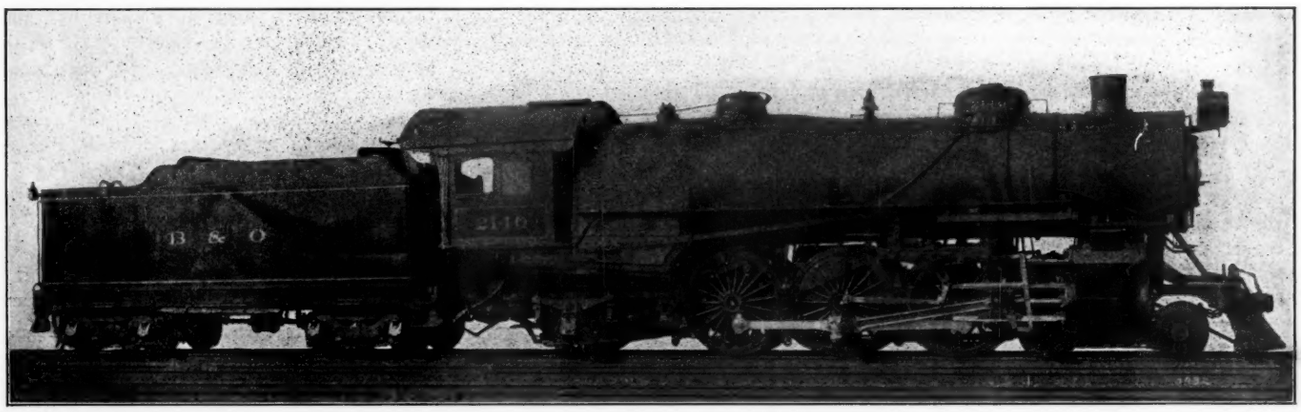
Cross-sections of Mikado Locomotive; Baltimore & Ohio.



Hodges Type Trailing Truck; Baltimore & Ohio.

sion locomotives thus far constructed and the principal ratios entering into the two designs show clearly how well the weight has been utilized. For each sq. ft. of heating surface, the Mikado locomotives weigh 54.7 pounds, and the Pacific type about 2 pounds less. The horsepower output is limited by the boiler capacity, and the advantage possessed by these two designs, in this important respect, is thus established, as the engines are comparatively light in proportion to the heating surface provided. The following are the principal ratios and dimensions of the two types of locomotives:

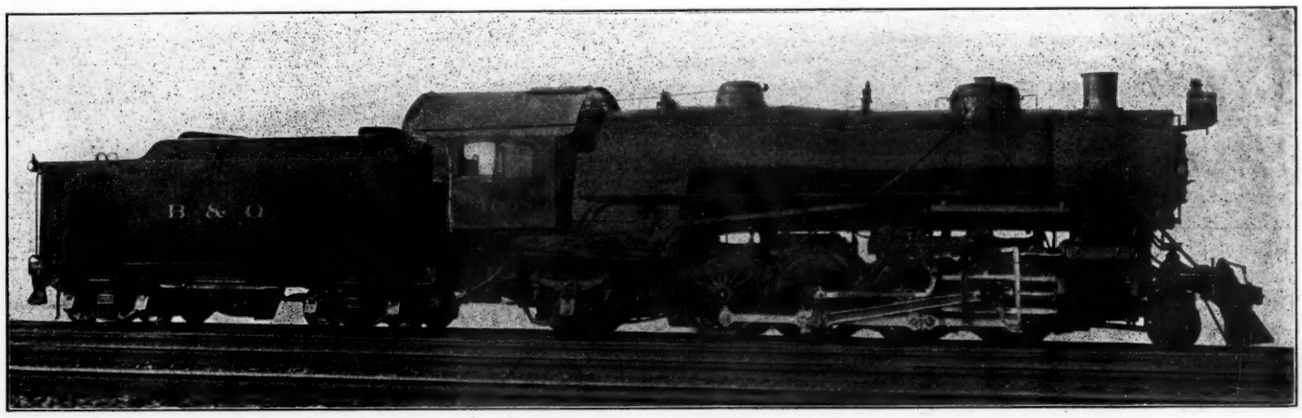
General Data.		
Type	2-8-2	4-6-2
Service	Freight	Passenger
Fuel	Soft coal	Soft coal
Tractive effort	50,200 lbs.	43,400 lbs.
Weight in working order	274,000 lbs.	263,800 lbs.
Weight on drivers	219,000 lbs.	166,200 lbs.
Weight of engine and tender in working order	450,000 lbs.	440,000 lbs.
Wheel base, driving	16 ft. 9 in.	13 ft.
Wheel base, total	35 ft.	34 ft. 8 in.
Wheel base, engine and tender	71 ft. 2⅝ in.	70 ft. 10⅝ in.
Valves.		
Kind	Bal. piston	Bal. piston
Wheels.		
Driving, diameter over tire	64 in.	74 in.
Driving, thickness of tire	4 in.	4 in.
Driving, journals, main, diameter	11 in. x 13 in.	11 in. x 13 in.
Driving, journals, others, diameter	9½ in x 13 in.	9½ in x 13 in.
Engine truck, diameter	33 in.	33 in.
Engine truck, journals	6 in. x 10 in.	6½ in x 12 in.
Trailing truck, diameter	44 in.	44 in.
Trailing truck, journals	8 in. x 14 in.	8 in. x 14 in.
Boiler.		
Style	Wagon top	Wagon top
Working pressure	205 lbs.	205 lbs.
Outside diameter of first ring	78 in.	78 in.
Firebox, width and length	84 in. x 120 in.	84 in. x 120 in.
Firebox, plates, thickness	⅜ in.	⅜ in.
Firebox, water space	5 in.	5 in.
Tubes, number and diameter	389—2¼ in.	389—2¼ in.
Tubes, length	21 ft.	21 ft.
Heating surface, tubes	4,789 sq. ft.	4,789 sq. ft.
Heating surface, firebox	228 sq. ft.	228 sq. ft.
Heating surface, total	5,017 sq. ft.	5,017 sq. ft.
Grate area	70 sq. ft.	70 sq. ft.



Pacific Type Locomotive; Baltimore & Ohio.

Ratios.		
Total weight ÷ tractive effort	5.45	6.08
Weight on drivers ÷ tractive effort	4.36	3.83
Tractive effort × diam. drivers ÷ heating surface	640	640
Total heating surface ÷ grate area	71.7	71.7
Firebox heating surface ÷ total heating surface, per cent.	4.55	4.55
Weight on drivers ÷ total heating surf.	43.65	33.1
Total weight ÷ total heating surface	54.7	52.7
Volume both cylinders, cu. ft.	16.76	16.76
Total heating surface ÷ vol. cylinders.	299.5	299.5
Grate area ÷ vol. cylinders	4.18	4.18
Cylinders.		
Kind	Simple	Simple
Diameter	24 in.	24 in.
Stroke	32 in.	32 in.
Tender.		
Tank, style	Water bottom	Water bottom
Wheels, diameter	33 in.	36 in.
Journals	6 in. x 11 in.	6 in. x 11 in.
Water capacity	9,500 gal.	9,500 gal.
Coal capacity	16 tons	16 tons

In 1910 the gross earnings of the Shantung Railway were 9.4 per cent. greater and its working expenses 5.5 per cent. greater than the year before, resulting in an increase of 10.9 per cent. in net earnings, which permitted a dividend of 6½ per cent. on the common stock. About 56 per cent. of the tonnage carried was coal, which accounts for the whole increase in freight traffic. There was a decrease in passenger traffic, which was affected by the presence of the plague a little further north.



Mikado Locomotive; Baltimore & Ohio.

FUEL ECONOMY ON THE CHICAGO & ALTON.

An interesting example of the economy of fuel gained by the use of superheaters and the provision of ample heating surface is shown by a comparison of the coal consumption of mikado superheater locomotives and non-superheater consolidation locomotives on the Chicago & Alton. The mikado locomotives were built by the American Locomotive Company to replace the consolidation locomotive on the Chicago division. The figures are given for two sets of engines of each type, with slight differences in construction, which are indicated in the table giving the principal dimensions. The tractive effort of the consolidation locomotives is 43,305 lbs. for 57-in. drivers and 39,800 lbs. for 62-in. drivers. For the mikados it is 51,590 lbs. The cylinders of the consolidation locomotives are 22 in. x 30 in. and the boiler pressure is 200 lbs. On the mikados the cylinders are 28 in. x 30 in., an increase of nearly 62 per cent. in cylinder volume, but the boiler pressure is reduced to 160 lbs. The grate area of the mikados is also materially increased and is 50 per cent. larger than that of the consolidations. The tubes in the mikados are 4 ft. longer than those in the consolidations, and 30 of these are 5¼ in. in diameter, to provide for the smoke tube superheaters of the Cole side header type.

All of these locomotives have been running regularly in freight service between Bloomington and Chicago, 121 miles. The only important grade is .3 per cent. for 5 miles and the average speed over the division is 12 miles per hour. The consolidation locomotives were used in this service in 1909 and until the mikados were received in May, 1910, so that the comparison between the two classes of engines is for similar service on the same division and for very nearly the same months. The coal per 100 ton-miles is taken from the monthly performance sheet and includes all coal charged up against the engine—that used for hauling the train, that used at the terminal for firing up and that used while the engine was standing awaiting the train. All the engines were on full tonnage rating from Bloomington to Chicago, but on account of traffic conditions they never got a full tonnage train from Chicago to Bloomington. For this reason, the coal per 100 ton-miles may be regarded as high when compared with engines working steadily with a full rating. The figures for coal consumption are the average for the month for 20 mikado locomotives and for 10 each of the consolidations.

Comparing the coal consumption of the two types of engines for this service, we find for the month of November, 1909, the average for all consolidation locomotives was 22.74 lbs. per 100 ton-miles, while that of the mikados for October, 1910, was only 16.94 lbs., a reduction of more than 25 per cent. For the month of December, 1909, the consolidations averaged 30.28 lbs., while the mikados used an average of only 19.43 lbs., a reduction of over 35 per cent. in fuel per 100 ton-miles. The figures would indicate that the mikados with superheaters might be expected to save 30 per cent. of the fuel used in the winter months by the large consolidations. Taking the actual number of pounds of coal used by the 20 consolidations in December as 10,000 tons, a saving of 30 per cent. of this by the mikados equals 3,000 tons per month, which, at the low figure of $2 per ton, represents a saving of $6,000 per month due to the use of the 20 mikado engines with superheaters.

Principal Dimensions and Fuel Consumption of Consolidation and Mikado Locomotives on the Chicago & Alton.

	Consolidation Locomotives.		Mikado Locomotives with Superheaters.	
	Nos. 420 to 429.	Nos. 430 to 439.	Nos. 800 to 809.	Nos. 810 to 829.
Cylinders	22 in. x 30 in.	22 in. x 30 in.	28 in. x 30 in.	28 in. x 30 in.
Drivers	57 in.	62 in.	62 in.	62 in.
Weight on drivers	184,860 lbs.	203,500 lbs.	212,300 lbs.	215,200 lbs.
Engine in working order	207,360 lbs.	228,000 lbs.	269,000 lbs.	273,700 lbs.
Tractive effort	43,305 lbs.	39,800 lbs.	51,590 lbs.	51,590 lbs.
Heating surface, tubes	3,036.7 sq. ft.	3,175 sq. ft.	2-in., 2,493.7 sq. ft. 5¼-in., 820 sq. ft.	2-in., 2,493.7 sq. ft. 2⅜-in., 840 sq. ft.
Heating surface, total	3,251.5 sq. ft.	3,372 sq. ft.	3,525.7 sq. ft.	3,545.7 sq. ft.
Grate area	33.6 sq. ft.	33.6 sq. ft.	49.5 sq. ft.	49.5 sq. ft.
Average amount of coal consumed per 100 ton-miles	Nov., 1909—23.13 lbs. Dec., 1909—31.74 lbs.	Nov., 1909—22.35 lbs. Dec., 1909—28.82 lbs.	Oct., 1910—16.94 lbs. Dec., 1910—18.75 lbs.	Dec., 1910—20.16 lbs.

BREAKING-IN-TWO OF FREIGHT TRAINS.

The discussion of the cause of breaking-in-two of freight trains at the recent meeting of the Air Brake Association proved to be the most important topic considered at the convention.

F. B. Farmer advocated the prompt inspection, reporting and repair of draft rigging in the yards before the trains are finally made up; the removal of porous hose; and such manipulation of the brakes as will prevent undesired quick action. He advocated making only one reduction in applying the brakes, so as to avoid the rough handling due to several applications. Other members favored a first reduction sufficient to reduce the speed of the train down to about 8 miles an hour and then a further reduction for the stop. The paper explained that trains break in two on account of the shock caused by irregular brake power throughout the train, and said that regardless of the condition of brakes it was possible to make smooth stops by careful manipulation in brake handling. It was also explained that irregular brake power is produced by differences in piston travel on different cars.

As a supplement to Mr. Farmer's paper, M. E. Hamilton gave an interesting account of dynamometer experiments made on the Santa Fe for the purpose of determining the best distribution of empty and loaded cars in a train to prevent trains parting. He found that good results could be obtained in the average freight train by placing about 12 empty cars in front, then 10 loaded cars, and following them with 20 empty cars, the important thing being not to have loaded cars either at the front or rear.

T. J. Langan, of the Delaware, Lackawanna & Western, has been consistently working in this direction, but has made it a rule that the number of empties next the engine should not exceed ten. He stated that he thought the original cause of weak draft gears was due to the damage in hump the yards, where the cars are thrown together at speeds of from 3 to 8 miles an hour with shocks amounting to from 300,000 to 600,000 lbs. In order to prevent the excessive speeds in the operation of the hump yard they had made it a rule to require the men who ride the cars to stay on them until the couplings are made, and that the speed at the time of the automatic coupling should not exceed 2 miles per hour. In consultation with the transportation officers, it was found that it was impossible to entirely stop the abuse of the cars at humps, and Mr. Langan, therefore, concluded that the only remedy for damaged couplers and draft gear thus produced was the use of friction draft gear which would absorb a large percentage of the shock.

The president of Brazil issued a decree on March 29, 1911, authorizing the finance minister of Brazil to issue bonds to the amount of $15,000,000. The proceeds of this issue will provide funds for the payments due to the contractors of the Madeira-Mamore Railway, the Sao Luiz-Caxias Railway, the extensions of the Sobral and Rio Grande do Norte Central lines, and various other connecting lines under construction in the states. The bonds will be of the par value of $500, and will bear 5 per cent. interest, payable semi-annually. Amortization will be at the rate of ½ per cent. per annum.

Maintenance of Way Section.

CONTRIBUTIONS should be sent in promptly for the contest on how the roadmaster can promote efficiency. Several good papers have been received already. This subject is of such general interest to all men engaged in maintenance of way work—roadmaster, engineer and superintendent—and has received so much attention, that the number of contributions should be large and a variety of ideas should be brought out. Nearly every progressive maintenance officer has worked out some plan which has bettered conditions in his department. A free exchange of ideas on this live topic will be of much value to every one engaged in this class of work. A first prize of $35 will be given for the best article received on this subject, and the second prize will be $20. We will pay our regular space rates for all others published. All contributions must be received by the civil engineering editor of the *Railway Age Gazette,* 417 South Dearborn street, Chicago, not later than July 1.

SEVERAL good kinks were submitted in the general competition just closed, describing methods of handling bridge maintenance. To draw out more in this line we announce a contest on bridge kinks, to close August 1; it will include methods of handling problems, either of repairs or renewals, commonly met with in the maintenance of timber or permanent bridge structures. In this class of work the methods of operation have to be carefully worked out in advance, and the plan of procedure adopted carefully followed during the work. Much greater preparation and precision are required than in ordinary track work, for when the track is once disturbed by a bridge renewal the definite amount of work outlined must be done before the track can again be put in service; and any hitch in the program will tie up traffic. The ways of handling this sort of work vary greatly and afford much opportunity for originality and ingenuity. A first prize of $25 and a second prize of $15 will be awarded for the best two contributions, while all others published will be paid for at our regular space rates. All contributions must be in the hands of the civil engineering editor of the *Railway Age Gazette,* 417 South Dearborn street, Chicago, by August 1.

THE judges of the track kink competition which closed June 1, were H. J. Slifer, general manager of the Chicago Great Western; E. P. Bracken, assistant general manager of the Chicago, Burlington & Quincy, and W. H. Finley, assistant chief engineer of the Chicago & North Western, who have carefully gone through the twenty-four contributions received, of which thirteen are given elsewhere. The contribution on Picking Up an Unloading Plow, by A. M. Clough, supervisor of track of the New York Central & Hudson River at Batavia, N. Y., was awarded the first prize of $25, and the second prize of $15 was awarded to G. Le Boutillier, division engineer of the Pennsylvania Railroad at Cincinnati, Ohio, for his contribution on the Monkey Bar. Other kinks which were accepted for publication were submitted by C. F. Green, supervisor of bridges and buildings, Southern Pacific, Sacramento, Cal.; M. Ganley, roadmaster, Santa Fe, Argentine, Kan.; E. Keough, roadmaster, Burlington, Aurora, Ill.; J. M. Sills, district engineer, St. L. & S. F., Springfield, Mo.; R. Huber, roadmaster, Burlington, Brookfield, Mo.; H. H. Cleveland, roadmaster, Santa Fe, Wellington, Kan.; Robert H. Orwig, supervisor, Cumberland Valley Railway, Chambersburg, Pa.; B. P. Kyle, El Paso & Southwestern, Douglas, Ariz.; M. Joyce, roadmaster, Chicago & North Western, West Chicago, Ill., and A. M. Clough, supervisor of track, New York Central, Batavia, N. Y. While no doubt some of these kinks may not be new to part of our readers, we believe they are worth publishing if they are new to a large number. It probably would be possible to get descriptions of very few good new track devices or methods which are new to all, but if economies can be gained by a more general use of any device not now known to a large number it is deemed worth describing. The matter submitted was, as a whole, very good and the contest highly successful.

THE work being done by the Educational Bureau of the Union Pacific for the education of the maintenance of way employees of that road deserves general attention. While the results of it may not appear as quickly as those of a prize or a bonus system, they are apt to be more permanent; and experience has been that the work of a student in one of the courses shows a marked improvement within a short time. The taking of a course is optional with the employee, and the benefits secured by him are proportionate to the labor that he expends on it. Most track men have but an elementary education and usually have no chance to study further if they desire. It very frequently happens that the best track man in a gang cannot be promoted to a foreman because he is unable to make out the necessary reports; while many foremen who can handle all sorts of difficult track work dread the clerical work. While the educational work benefits the company by helping to develop a class of men eligible for promotion, the men are benefited to a greater degree by being made eligible for promotions which otherwise they could never get. It is encouraging in these days of pessimistic ideas concerning track work to note the enthusiasm with which track men on the Union Pacific are studying, and hear them say that by it they are learning many new things about track work which are helping them in their everyday labor. The fact that the railway company gives these courses free of charge ougth to develop a bond of common interest and tend to revive the old spirit of loyalty which was formerly common among track men, but which is seen but occasionally now, and then only among men of the "old school."

IN this day of specialization we are too apt to confine ourselves entirely to our own narrow field. This point is emphasized by a division engineer in his talk to maintenance employees, which is given in another column. Intelligent and trained men are necessary in charge of signal systems, of bridge structures, of elaborate stations and other buildings, and of electric transmission systems; and there is danger that in the training of these men they will be developed into mere signal or bridge maintainers instead of broad railway employees maintaining signals or bridges. Will such employees notice a signal at "proceed" at the entrance to a block in which a train is standing, or will they notice a cut beginning to slide toward the track? Do they know what clearance is required to insure that a train can pass under some nearby part of a structure? If they do know these things, do they know what measures to take to remedy bad situations and how to report them? Many railway officers are working individually to meet the tendency towards excessive specialization, but, generally speaking, the railways are not doing enough to broaden their men. It is not essential that a bridge carpenter be able to put in a frog, or that a section man be able to test for wire failure, but the bridge man should recognize defective or unsafe track when he sees it, and the section man should notice and remove a fallen limb from a telegraph wire. Any employee in the maintenance of way department, whether he be a carpenter, lineman or tinsmith, should recognize and be able temporarily to repair, or at least protect, any dangerous condition he may find, until a skilled workman is able to reach it. To

make sure that employees have this general knowledge it is the practice on one road to require all men in the maintenance of way force who are employed in independent work near the track, such as carpenters or linemen, to pass an examination on such operating rules as affect safety. In addition to this, meetings are held at intervals at which the different rules are discussed and their necessity explained, in this way securing greater co-operation between the employees of different departments. To encourage the men to look beyond their own work a number of roads are making special mention or giving merit marks to those who do something out of their regular prescribed duties. For example, on the Rock Island a section foreman was recently credited with 10 merit marks for detecting a broken arch bar on a passing train, and on the Canadian Pacific a section foreman was given three marks for making temporary repairs to a copper telegraph wire.

COST DATA.

MANY engineers or roadmasters have no definite idea of what the piece of work they may be doing is costing them. They know they are expected to handle it as it has been handled before, and they may perhaps make some changes where the possibility of improvement is evident, but they do not know how much of a saving may have resulted. On most railways few, if any, of the men actually in charge of work see any figures regarding its cost. The time rolls and charges for material are sent to the general auditor's office, where the charges are entered under the headings prescribed by the Interstate Commerce Commission, and no definite detailed cost data is secured even here With this state of affairs there is not a great deal of incentive for a man to try to lower the cost of any work below the general average, for neither he nor any one else will know the resulting saving. If, on the other hand, foremen were advised each week or month just what their work during the preceding period had cost, they would have these figures continually in mind and would try to lower them by a better arrangement of forces or the adoption of methods. They would know that both good and poor management would show at once in their records and that their work would be judged accordingly by their superiors.

The unit costs of similar work done by different men made up on a small report and sent to all would tend to stimulate each to keep his costs down. Such data would also uncover many leaks that are now unnoticed, for attention would at once be called to any figures that were unusually high and the causes would no doubt be ascertained. The results obtained by any two men's work side by side will vary widely, and the poorer man can always be shown his weakness far more clearly and forcibly by a definite comparison of figures than by any general criticism.

Any work done without a knowledge of its cost is sure to be expensive, for when the man in charge does not have the expense he is incurring constantly impressed on him, many unnecessary items will escape his attention.

It sometimes happens that a supervising officer will require a certain piece of work to be done a certain way simply because it is his way, although there may be other methods equally good. Such unreasonable restrictions are an indication of narrowness, and have a bad effect upon subordinates. It is difficult enough to get men to think without unnecessarily discouraging such action. If a subordinate gets the same results by a method different from that to which his superior is accustomed, he should be encouraged to continue to use it; for when he relies on his own initiative he may discover methods better than any previously tried. He who studies his work carefully is also thereby better equipped to handle other work. The increased clerical labor involved in an adequate tabulation of cost data is small and will be repaid many times over by the stopping of leaks and the better results secured.

AVAILABLE SUPPLY OF SECTION FOREMEN.

A ROADMASTER on a main line division of a road that has a reputation for maintaining its track at a very high standard says that on his territory there are just four men who are not now section foremen who would be available for promotion to that position in case of necessity, and that none of them has shown a capability for the work. This roadmaster frankly says that he sees no way to supply the demand for section foremen that must arise as his present foremen leave the service. His only hope is that in some way he may be able to keep these men on their sections as long as he is responsible for the division, and beyond that he does not concern himself. This condition is by no means peculiar to the road referred to. It is safe to say that a majority of the roads of the country have no available supply from which to draw competent foremen, and are now facing a serious problem on this account. While the roadmaster is directly responsible for the appointment of section foremen and should keep in mind the necessity for training men for that position, the present situation is one that should also have the consideration of operating and maintenance of way officers in general.

The reasons for the lack of available men for foremen's positions are so well known to maintenance men that they require little comment. Briefly, the situation is about this: A section foreman capable of efficiently maintaining high grade track must be intelligent and experienced, industrious and reliable, and have the ability to handle men. The natural qualifications required were found in a high degree in the Irish and German track men who a few years ago were found on American railways in large numbers. Men of this class, however, have been drawn into other lines of work because the rate of pay of track men has not increased as rapidly as that of laborers in other lines. Native Americans, or the descendants of these old track men, make good foremen as a rule, but the necessity for spending several years as laborers before they can become foremen prevents the most desirable men of this class from going into track work. The men who can do section work at prevailing rates of pay are, for the most part, immigrants from southern Europe and Mexico. These people come in groups, live in poor quarters, and either return to their homes after collecting a small amount of money or drift into some commercial line as they become acquainted with American customs. The number of immigrants that can be made into good section foremen by the usual methods is very small. In some cases, however, where special efforts are made to interest the men in track work and to teach them the details of proper maintenance, good foremen are secured.

The natural result of the difficulty of obtaining competent foremen is that incompetent men are filling these positions in many cases. One roadmaster can no longer rely on any one foreman on his division to cut the rail and install a switch; when such work must be done he sends two foremen to work together. Within the past month a serious wreck on a western road was caused by the neglect of a section foreman to send out a flagman a sufficient distance from the point where rail was being relaid. Similar instances of inefficiency on the part of foremen have led some roads to experiment with systems of training section foremen. The Union Pacific has tried a "school gang," in which prospective foremen are placed and instructed by competent men in all branches of maintenance. By this system the men are fitted for foremen's duties in a much shorter time than is common, and on that account a better class of men is secured.

All consideration of this problem, however, must lead to the conclusion that the real cause of the scarcity of good section foremen is the low rate of pay which is offered on American roads for this work. There does not seem to be the necessity for increasing the pay of section men as long as they are immigrants who are willing to work for present wages, but until the pay offered section foremen is made materially greater and more consistent efforts are made to train them, the problem of securing efficient foremen will continue to be serious.

ENGINEERING ARTICLES SINCE MAY 19.

THE following articles of special interest to engineers and maintenance of way men, and to which readers of the engineering and maintenance of way number may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since May 19:

Enginering Law.—Review of a book on the law of contracts as applied to engineering practice. May 26, page 1193.

Recent Immigrant in Railway Construction and Maintenance of Way Work.—W. J. Lauck, who made the industrial investigations for the Immigration Commission, gives the results of his investigation as applied to railway labor. May 26, page 1201.

China's Most Modern Railway.—The Shanghai-Nanking Railway is the best example of modern railway building in China, on which permanent construction has been made. The article on page 1241 of the issue of June 2 gives the interesting features of the construction work and the conditions surrounding the building of this road.

Notes on Plate Girder Design.—Review of a text book on the design of plate girder structures. June 9, page 1301.

The architectural features of the new passenger station of the Chicago & North Western in Chicago were described and illustrated in the issue of June 9, page 1311.

EFFICIENCY IN TRACK WORK.

BY AN EX-TRACK INSPECTOR.

The recent editorial remark in the *Railway Age Gazette,* that the maintenance of way methods of twenty years ago must be cast aside, compels anyone interested in this important department of railway work, to pause and consider if track supervision has not deteriorated to almost the same extent as track labor, and if it would not be well to *return* to the methods of twenty years ago.

That track labor has deteriorated, both in efficiency and intelligence, is a grim fact, and the railways have themselves to blame for the fact that while cost has gone up, efficiency has gone down. It was not in their power entirely to keep down the cost any more than it is in our power to keep down the cost of living, but it was in their power to maintain efficiency and by maintaining efficiency, they would at least have obtained better results for their outlay. It is a question if they would not have secured better results with a smaller increase of expenditure than they are forced to make today if they had adopted a more liberal policy when the signs of the times pointed to the fact that such a policy was due. However, they did not do this, and they have, and must continue to pay for their mistake. They have lost men by a mistake in policy, and it was inevitable that in losing them they should lose some of their better methods.

To illustrate, twenty-six years ago a Canadian railway was running what was then claimed to be the second fastest train in the world, a train running north out of London, England, holding first place. The road this train ran on was new, was cheaply built, had little ballast, was only three-quarters tied, and was laid with 56-lb. rail, with stub switches. It was made up of four cars, baggage, second class, first class and Pullman, and the engine was the same class as is used today on many four-car trains. There was also the usual number of local passenger and freight trains. To maintain such a track under such traffic required better men and more scientific methods than are in vogue today on 99 per cent. of our most up-to-date railways. I doubt whether, with the men of today and under our present methods, any of us would dare to run such a train over such a road for one trip; yet the train I have reference to ran for two years, and never once met with an accident.

The men who made this possible were sons of Canadian farmers, and they were paid $1.00 per day, the foreman getting $1.25. There were three men and a foreman to each section of seven miles. The method used was as follows: In the first place, the track was put in almost perfect line, surface and gauge by a small extra gang under an engineer and foreman, the former giving line and surface with his instrument. Then it was left to the roadmaster and section crews. Independent of the roadmaster, there was a track inspector, who rode over the line each day on the fast train, and it was his business to pick out and note all spots not riding smoothly. The two worst spots on each section he reported to the foreman, either by throwing a note from the end of the train, or by wire, and it was the foreman's business to attend to these at once. At the end of the trip the inspector compiled his report, sending one copy to the roadmaster and one to the general manager. It was the roadmaster's duty to see that the spots were attended to promptly, and the manager's office could check him each day, and see that he did it. A spot reported two days in succession called for an explanation. The roadmaster laid out his season's work and proceeded with it, but the daily inspection of section and attention to the spots reported by the inspector had precedence over regular work. This took up from two to four hours of the section crews' time each day, the remainder being put on the regular work of putting in ties, surfacing, lining, etc.

This may not appeal to some people as being unusual, or likely to give extraordinary results, but it did give such results. Ride over one hundred miles of ordinary railway, on the rear end of a fast train, and count the number of "rough" spots. Then subtract twenty-eight of the worst of these from your total, and think what a vast improvement this would make in the riding of that one hundred miles of road. Two rough spots taken out each day means twelve taken out of each section each week, and it does not need a diagram to show that the day will soon come when a rough spot will be hard to find. As a matter of fact spots worth reporting will soon be hard to locate from the end of a smooth-riding Pullman car and then the inspector should go up on the engine and begin all over again, for the engine will indicate many when the car will not show one.

If such methods, with the men we had in those days, could do so much with such a road, what could they do with our roads as they are today? But the men are gone, and so very largely are the methods, and there is every indication that we must go back to the methods and train the men up to them. It will cost money, but that is the price we must pay for following a short-sighted policy, by which we first killed the enthusiasm of our competent men, and then lost the men. At one time it was a question of money only, and not very much money. Now it is a question of both time and money, and much money.

As to the idea of offering premiums, or cash prizes, it is not new, and at best can only be of temporary benefit. I have had experience with it, and I think I know that men generally regard it as an attempt to get several hundred dollars' worth of work done for $50. Even so, it may speed things up for a time, but the final result is sure to be dissatisfaction, leading to a distrust of the company's sense of fair dealing and leaving a poor foundation on which to build for the future. Educational courses are a step in the right direction. They are necessary, and will do more than instruct the men. They will restore the enthusiasm that has been lost and that we miss so much. Then, with a more liberal policy in operation and closer and more effective supervision, we may soon more than make up what we have lost.

In using the term "liberal policy" I do not mean increase of pay for men, but much more than that, for there are things that count more than a small increase. When we have roadmasters and section crews interested in this work, they will lay out their season's operations with a liberal hand and do all possible to reach the point aimed at, which is, to get their track in the best possible shape against the time when winter closes down on them. For years it has been the policy to reduce the working force in the fall, just about the time the roadmaster and foreman are making their best efforts to reach their goal, and they are balked in their laudable desire to give their company the best

possible results for the money paid out. It is this kind of thing coupled with failure to receive material when it could be best used and the too-frequent removal of crews from their sections to lay new sidings, or do other extra work that cools enthusiasm and lowers efficiency.

There is a great lesson in the old story of the foreman who, when told that the pay car would be along tomorrow, replied, "To h—— with the pay car; did you see anything of that car of joint ties I am looking for?" We don't have to make an effort to keep up interest in the pay car, but let us do all we can to keep up an interest in "joint ties."

A TALK TO MAINTENANCE EMPLOYEES.*

BY A DIVISION ENGINEER.

You have been asked to come here where you can sit comfortably and quietly and think for an hour with me. One of the dangers of our work is that we get so engrossed in doing the specific thing that has been assigned us, carrying out instructions and getting our eight or ten hours of work completed, that we become machines and have a limited point of view. I think that if we make appointments with ourselves at intervals of six months or a year and try to consider where we are drifting and what we are trying to do, and spend the rest of the time getting things done, we have the greatest efficiency possible. You have been instructed and are daily instructed in your duties. I want now to tell you what they mean, how they count and the relative importance of our different duties.

The most important duty and the first rule in the book is that of safety. To promote safety every foreman on this division has been examined physically to see whether there is any tendency to heart disease, apoplexy or other bodily failure which would be dangerous for him or the patrons of the road. You have all been examined on color sense, eyes and hearing. You have passed a written examination covering the rules of safety and have had explained to you just what each one means. I want to emphasize the importance of having a knowledge of these rules so clear to you that action is automatic. If you will occasionally devote an evening or a Sunday to reading over the rules and refreshing your memory, you will be a more valuable man to the company and may save loss of life or damage to property.

These rules are useless unless they are enforced with common sense. For instance, a short time ago one of our bridge inspectors was sent to examine the construction of a bridge and see if some signal attachment could properly be made. At a point 2 ft. from that which he examined, the lower chord of the bridge was so corroded that it was in a dangerous condition and might have fallen on the track. The bridge inspector never noticed this. He did what he was told to do and did it correctly and then went to the station and waited 10 or 15 minutes for a train, instead of spending that 10 or 15 minutes thinking about what he was really sent out for and seeing whether there was any reason, other than the form of construction, which would prevent the attachment. That man knew enough to know that the bridge was dangerous, if he had been alert and noticed it, and the fact that he did not notice it indicates that he was not alert. This affects his chances not only of promotion, but also of staying on the road in any responsible capacity. That is, the rules represent the minimum action that is necessary; in additon to this you are asked to use judgment and common sense and to be alert; and you are asked to think.

Whenever we have reduced force, owing to a less amount of work being authorized, I have had a complaint from some foreman who did not believe that he, who had been in the service twenty years satisfactorily doing the work assigned to him, should be allowed to go while another man with less experience, who had only been on the road three or four years, was kept on the pay-roll. I have tried to explain to such a man (and I confess without much success) that the reason that they were allowed to go and men of less experience kept was that we believed that the latter men were thinking; that they were more liable to qualify for further responsibilities and promotion and that it was easier for us to teach them their duties than it was for us to teach the older employees to do more than their duty. This same principle applies when we increase force, owing to more work being authorized. In such cases we feel it is a personal criticism of ourselves if we have to employ additional foremen or inspectors to do such work instead of promoting men who have had a chance to earn the right to such promotion.

Prompt reports are necessary for modern railway operation. Men who decide what trains should run and, in the event of trouble, what help is necessary, are in a small room next to us and cannot see farther than across the street. Unless they know what is going on they are helpless, and while conditions seem obvious to those of us who are on the ground in any wreck or break-down they are not obvious to the man in the despatcher's office, unless he is told clearly and concisely, without prejudice, what the conditions are, what help should be given and when the tracks should be clear or the engine be in condition to run. You should remember that you are representatives of the railway while on the right-of-way. You will not be criticized for reporting a condition that has already been reported. Your way of stating it may add something to the knowledge of the despatcher, or it may be that he would appreciate the opinion of another man to strengthen his reasons for action.

Everything that affects operation should be reported to the train despatcher. After that, tell your immediate superior what you have done. If you get the use of the track and then protect it by the proper flags and torpedoes it is your business to yourself to report when you have completed your work on the track and it is again ready for the usual service. You are in a better position than any one else to tell when that work was completed if you did it. A few years ago a foreman got the use of a track for three-quarters of an hour and told the despatcher that the track would be all right after that. Then he finished his work and went home. The despatcher did not dare to put the track in service until he got a report of the actual completion of the work. He could not find the foreman. It was at night and he had to get hold of a roadmaster and wait until he had got there and walked all the tracks that had been put out of service and pronounced them in good condition before he could let trains operate over them. That foreman held up traffic on that track for two hours because he just did his own work and did not think what it meant, or stop to recall the rules.

If these generalities and incidents are suggestive enough to make one out of fifty of you try to think and devel p yourself, our hour has not been wasted. If all of us in passing over the right-of-way feel responsible not only for the work assigned, but also for the safe conduct of transportation and the protection of company property, we shall give the patrons of this road a protection and a seucurity that will increase travel, reduce cost and make the work safer for ourselves, who are on the trains a large portion of the time, and for our families and friends who may be traveling. We shall increase our own usefulness and I believe in time get not only the pleasure of doing good work, but also a chance for more responsibilities and a happier life.

*Last winter this engineer gathered together, several times a week, as many men as he could comfortably take care of in his office and made them this talk, after which they asked him questions.

DEVELOPMENT OF PORTLAND CEMENT INDUSTRY.

The development of the Portland cement industry in this country is shown by the following figures of production for the past ten years:

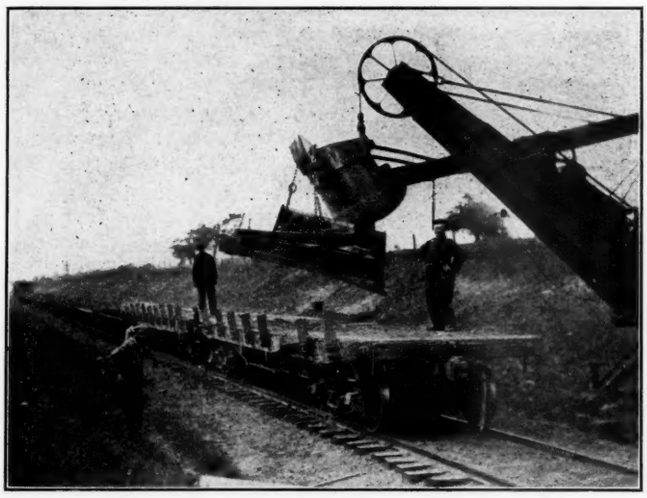
1901.....	10,711,225	1906.....	46,463,424
1902.....	17,230,644	1907.....	48,785,390
1903.....	22,342,973	1908.....	51,072,612
1904.....	26,505,881	1909.....	62,508,461
1905.....	35,264,812	1910.....	73,500,000

TRACK KINK COMPETITION

FIRST PRIZE—HANDLING AN UNLOADING PLOW.

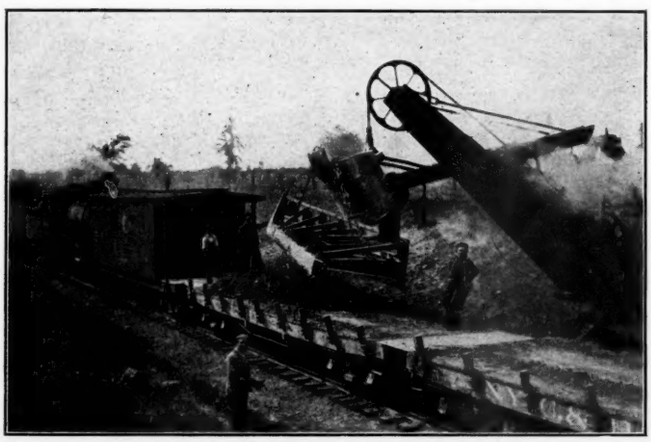
BY A. M. CLOUGH,
Supervisor of Track, New York Central, Batavia, N. Y.

In double tracking operations on the New York Central & Hudson River the following method of handling the unloading plow was used where a steam shovel was widening a cut, the material being unloaded a short distance from the shovel.



Lowering Plow.

The nearest siding was about three miles away. Instead of running to this switch, each time a train was unloaded, to shift the plow to the rear of the train, hooks and chains were arranged on the plow so as to balance it, and it was picked up by the steam shovel, a 70-ton Atlantic type, and held while the train pulled along underneath it, being placed on the last car ready to plow off another train. It required 30 minutes to run to the switch after unloading a train and switch the cars, including the



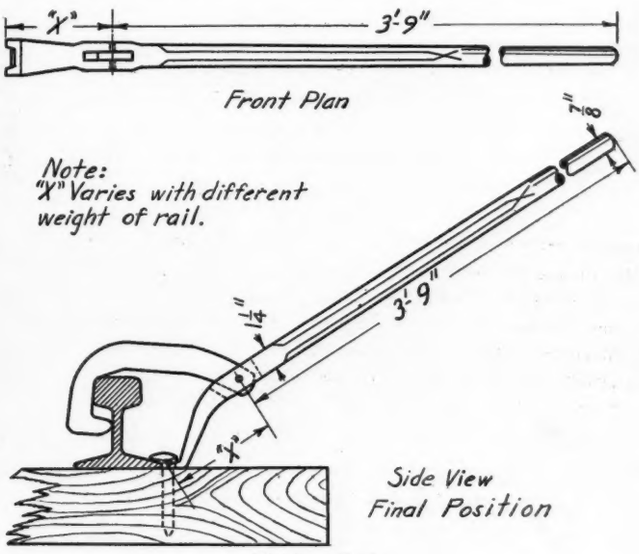
Unloading Plow.

turning back of two heavy aprons. Six trains were loaded and unloaded each day and the elimination of this switching resulted in a total saving of three hours for the train equipment and steam shovel. Practically no time was required to change the plow in this way, as the train stopped at the shovel just a few seconds to allow it to pick up the plow and then moved slowly along and stopped again while it dropped the plow down in the same interval and started loading at the forward end of the train.

SECOND PRIZE—RAIL MONKEY BAR.

BY G. LE BOUTILLIER,
Division Engineer, Pennsylvania Lines West, Cincinnati, Ohio.

This monkey bar is used when relaying rail to hold the new rail against the line of spikes which has not been drawn, as shown in the sketch. Ordinarily three men with lining bars are required to hold this rail to place while it is being spiked, but



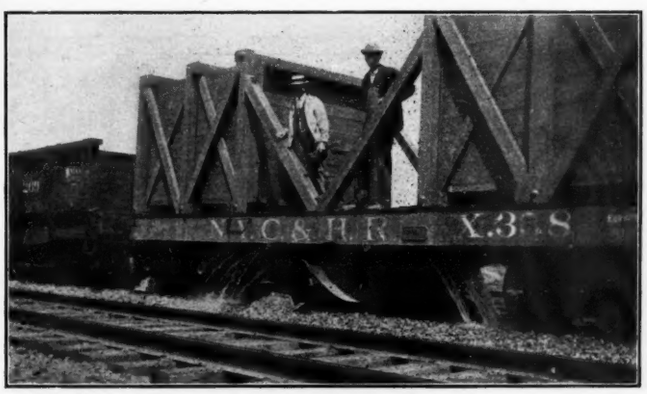
Monkey Bar.

by the use of this tool one man can do the work for the ordinary number of spikers. It has been used locally on the Cincinnati division and was made by the local blacksmith, the main bar being an old lining bar properly shaped. It has been found to work satisfactorily and result in a saving of labor.

SPRINKLING STONE BALLAST.

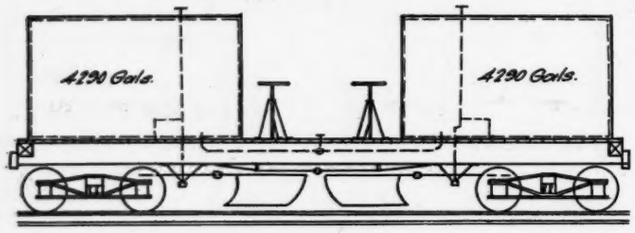
BY A. M. CLOUGH,
Supervisor of Track, New York Central, Batavia, N. Y.

When stone ballast is being laid the dust fills the cars to the discomfort and annoyance of passengers in coaches and dining cars. To eliminate this trouble a Rodgers ballast spreader has been equipped with two tanks of 8,000-gal. capacity, which are filled with water from the water columns near the work. They are provided with a sprinkling ar-



Sprinkler in Operation.

rangement similar to an ordinary street sprinkler, and while the stone is being unloaded and plowed out, the spinkler is operated with excellent results. The white stone dust is



Sprinkling Car.

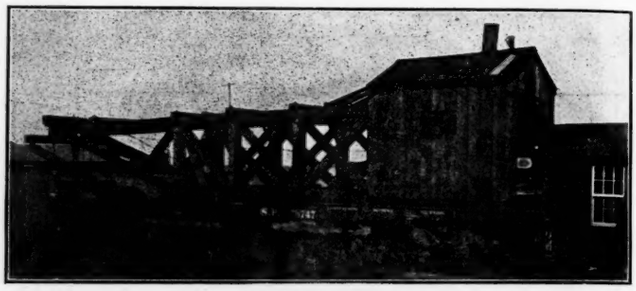
washed down to the subgrade and the stone left clean and blue and perfectly dustless.

RAISING A TRESTLE.

BY C. F. GREEN,
Supervisor Bridges & Buildings, Southern Pacific, Sacramento, Cal.

In the raising of 8,000 ft. of a six-stringer trestle approach to a steel girder bridge over the Yuba river at Marysville, Cal., which has just been finished, a special derrick car was rigged up and used successfully. The trestle had to be raised 7 ft. above the old caps, and is 14 ft. above the water, which varies from 4 to 8 ft. in depth. The work had to be done under a traffic of twelve regular and two extra trains during the day of 12 hours, and was handled with a derrick built by bridge carpenters at a cost of $215. A self-propelling pile driver was used as a work engine, being protected by flags, and a gang of 16 men was required, the wages for a 10-hour day amounting to $40.

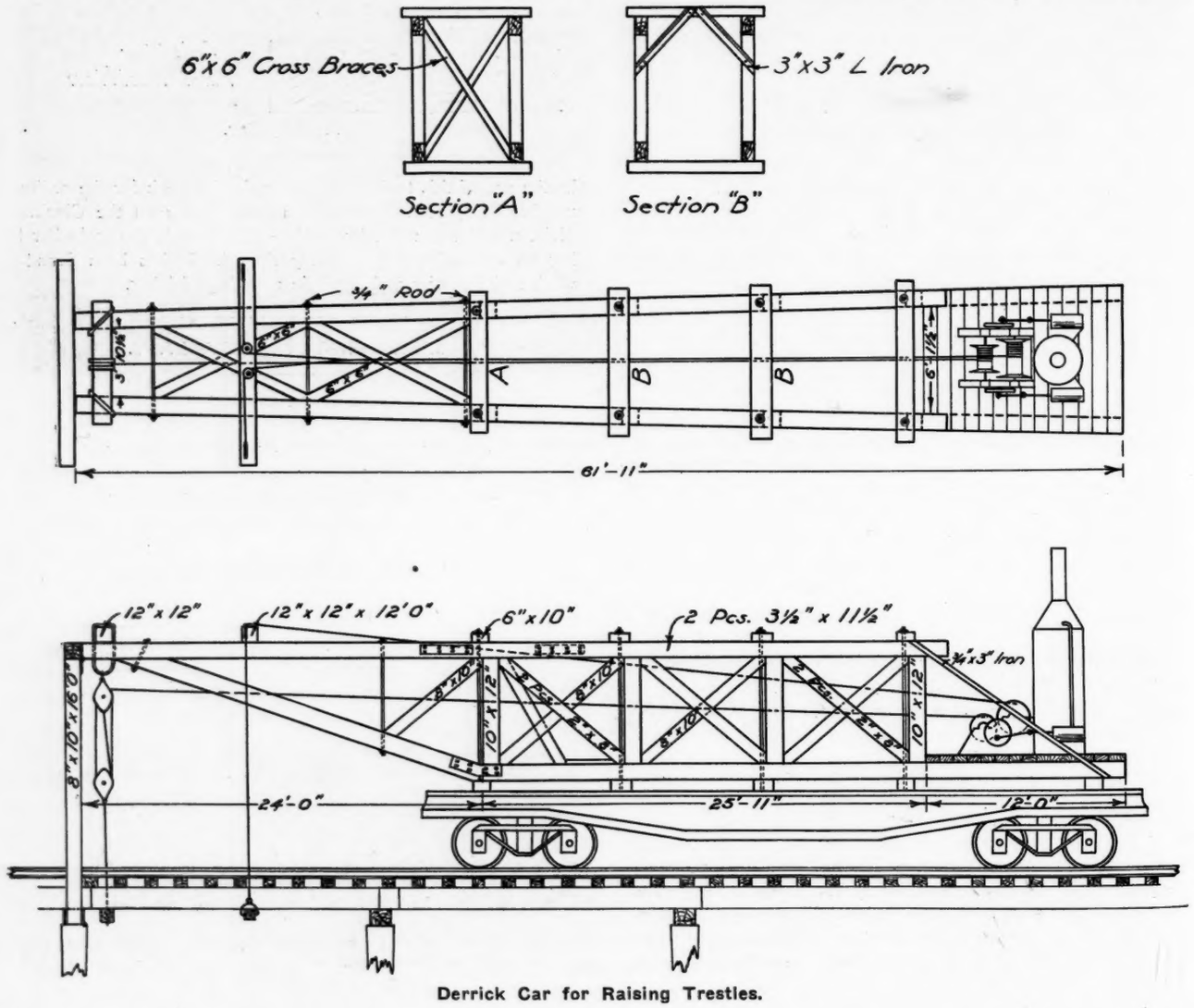
The derrick was built on a steel flat car and a double drum donkey engine was used. It was found that the weight to be lifted was too great for the front trucks of the car, and it was



Derrick Car.

necessary to put two legs under the overhang of truss with large hinges at the upper ends.

A single block was placed on the upper chord about 6 ft. back of the hinged legs, and a line with timber hooks on one end was run through the block to a gypsy on the donkey engine. This line was used to hoist these legs up, while moving the derrick,



Derrick Car for Raising Trestles.

catching them with timber hooks. This line was also used to hoist the blocking in place.

To hoist the deck of the trestle there were used a double three shive block with a ¾-in. wire cable attached to the head of the truss at the end of the overhang, and a piece of 12 x 14 Oregon pine, of a length sufficient to reach from outside stringer to outside stringer, and with a 2 in. eye bolt through its center long enough to come up through the ties and between the rails. After the piece of 12 x 14 timber was placed under the stringers a shackle pin from the lower block shackle was passed through the eye bolt, and the trestle was raised 18 or 20 in., off caps or blocking, for two bents of 15-ft. centers. This tackle is shown

Derrick Car in Service.

herewith fast between the rails, and the side line is raising a piece of timber with the timber hooks for blocking.

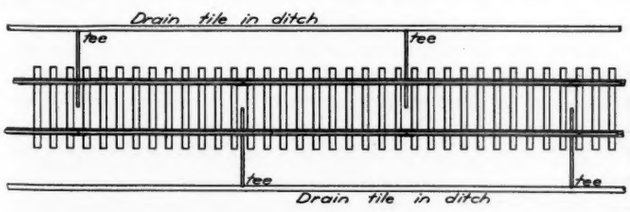
With this outfit two bents were raised and blocked every five minutes and made ready to move ahead. They were also raised, cribbed and shinned for a runoff to let trains pass in eight minutes.

One day was spent in cutting, cribbing and placing the material convenient to the work, and the next day in raising the trestle. Working in this way 1,120 ft. of trestle was raised one foot high at a cost of $80 for labor, or 7 1-7 cents per lineal foot of trestle. This method has the advantage that when not in use the donkey engine can be slid off the car and put to other use, leaving no money tied up in dead tools.

DRAINING SUBGRADE.

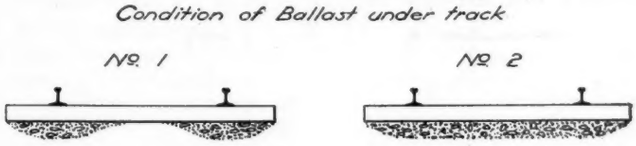
BY R. HUBER,
Roadmaster, Chicago, Burlington & Quincy, Brookfield, Mo.

The following method has been used to drain wet cuts and fills in northern Missouri: Test holes were first dug to find the bottom of the ballast. Levels were then run over the track by the engineer in order to provide for an ample fall and to be sure that the drain tile was placed low enough to drain the subgrade. Trenches were dug 18 in. below the ballast on each



Method of Placing Tiles.

side of the track from 5 to 6 ft. from the ends of the ties and 6-in. tile laid. T-connections were placed every rail length on each side, staggered, and drains laid to the center of the track. This tile was first laid at the ends of the tie, but the soil was so slippery that it was impossible to maintain the tile this way. Previous to the placing of this tile the track continually got out of surface and alinement, and there were places where slow orders were necessary three months out of the year. After the tile had been in 60 days—it takes about that length of time for the track to



settle after the tile has been placed—no slow order has been necessary, because of defective track; and some of the tile has been in three years.

DERAILING GUARD RAIL.

BY R. P. KYLE,
El Paso & Southwestern.

At many points, such as ore loading chutes, empty cars are shoved in on a spur and dropped down by hand as fast as they are loaded. Very often in dropping these cars the laborer uses poor judgment and they are derailed. Being very heavy, it is

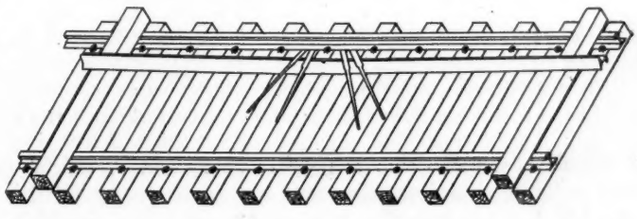
Derailing Guard Rail.

necessary to unload them before they can be re-railed. This guard rail opposite the derail keeps the truck up next to the rail, and makes it very easy to place a frog and pull the car back on the track.

METHOD OF BREAKING RAIL.

BY J. M. SILLS,
District Engineer, St. Louis & San Francisco, Springfield, Mo.

Cut ½ in. to ¾ in. into one edge of the base of the rail with a chisel at the point where the rail is to be broken.



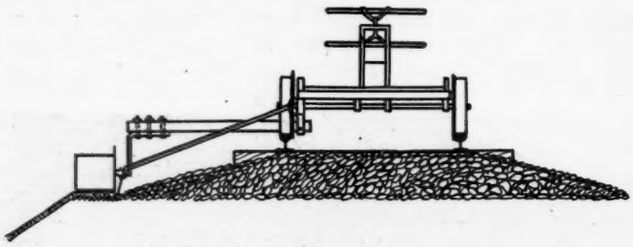
Then place the rail on two ties about 20 ft. apart with the notched edge down, as shown in the figure. With four or

five men bearing down heavily on bars placed across the rail, as indicated, place the chisel on the base exactly above the place where it is cut and hit with the maul. Usually one stroke is sufficient to make a clean break. If it is necessary to make the cut close to the end of the rail, fasten another rail to the one which it is desired to cut by means of angle bars, and proceed as before. The resulting break is even more perfect than can be obtained by sawing.

SOD LINE TRIMMER AND ROLLER.

BY A. M. CLOUGH,
Supervisor of Track, New York Central & Hudson River, Batavia, N. Y.

A sod line trimmer and roller saves a lot of hard, tedious labor where a sod line is maintained on the shoulder of first-class track. It is made to attach to an ordinary hand car, is adjustable to any gage, and can be unshipped in a few seconds. It consists of a sharp cutting disc attached to a



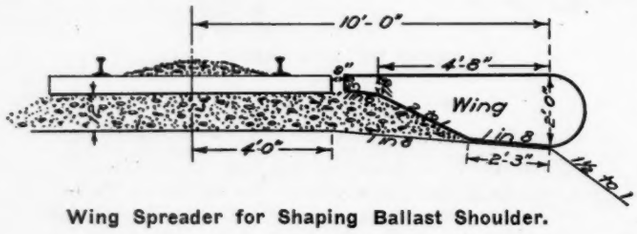
Sod Liner, Trimmer and Roller.

roller and cuts the sod clean as it is pushed along. A small plow inside the cutting disc plows in any sod trimmed off far enough so it can easily be removed with a shovel. A section gang of six or eight men can do more of this work with this tool in a day than fifty men with spades.

WING SPREADER FOR SHAPING BALLAST OF EMBANKMENT SHOULDER.

BY H. H. CLEVELAND,
Roadmaster, Atchison, Topeka & Santa Fe, Wellington, Kan.

This device is a wing to be used on a dirt spreader for shaping a ballast shoulder of sand, gravel, cinders or other low material. It can also be used for renewing the subgrade shoulder of the embankment without disturbing the ballast shoulder. In renewing the subgrade shoulder the dirt can be unloaded on to the ballast shoulder in the ordinary way. If this wing is properly adjusted at an angle of 50 or 60 degrees and run over the embankment it will clean this dirt off the ballast shoulder and place it on the subgrade, at the same time pushing the surplus



Wing Spreader for Shaping Ballast Shoulder.

dirt over the embankment, without disturbing the ballast. In dressing up the ballast shoulder, if the wing is placed at an angle of 50 or 60 degrees and the machine backed up this wing will gather the scattering ballast from the subgrade and place it on the ballast shoulder without mixing it with the dirt, if the wing is properly handled. With this device an amount of embankment could be shaped up that would require a large number of men. Also, it is not necessary to remove the ballast shoulder, with the resulting expense and loss of ballast when widening an embankment.

RATCHET WRENCH FOR TRACK WORK.

The Burlington is experimenting with a ratchet wrench for putting on and taking off nuts on track bolts in connection with the relaying of rail. The wrench being used is a common ratchet wrench secured from the machine shops, and will remove the nuts in less than half the time required with the common stiff wrench. It is advisable, however, to start and tighten the nuts with the common wrench because of the heavy pressure necessary. This wrench is, of course, especially adapted to use

Ratchet Wrench for Track Work.

in connection with rail renewal or when putting on nut locks, but it cannot be advantageously used by the section man in tightening bolts. The wrench being used experimentally fits only the hexagonal nuts, but any wrench can be adapted. It can be made to fit square nuts on one end and hexagonal on the other. The wrench is being used under the direction of Roadmaster R. C. Violett, who finds the results so far very satisfactory.

PLACING TIES.

BY ROBERT H. ORWIG,
Supervisor, Cumberland Valley, Chambersburg, Pa.

The usual practice in placing crossties in the track is for two or three (generally three) men to pull the ties under the rails with picks or tongs. When the tie is approximately in its proper position, one of the men measuring with a mark previously made on his pick handle or with a rule, to see if the end of the tie is the correct distance from the line rail. It usually is not, and the other men are standing idle while this measuring is being done, then move the tie to its proper position.

When the spikers come to spike the rail to the new tie, one of them will again measure the distance from rail to edge of tie to be sure it is correct, as frequently the ties are moved before they are spiked. Assuming that he finds the distance correct, he and his two assistants have lost five seconds each, or a total of fifteen seconds. Adding this to the forty-five seconds lost by the tie men makes a total of one minute lost for each tie, apparently an insignificant amount of time; but when it is considered that at least 60,000,000 crossties are used by the railways of the United States, the amount of time lost would be 1,000,000 hours, which at 16 cents per hour makes $160,000.

To save this time, let the foreman make a chalk mark on each tie the proper distance from the line and where the outside base of the rail will come. This can be done with-

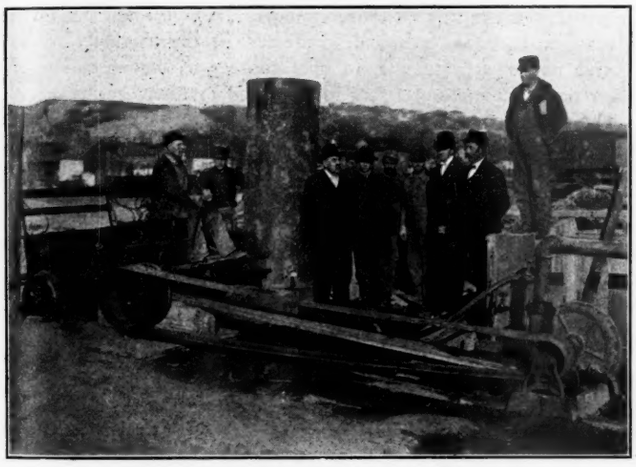
out any loss of time by any of the men. When the tie men pull the tie in the track, they stop when the base of the rail is at the chalk mark. When the spikers see the chalk mark they go ahead with their work and do no useless measuring; if the tie has been shifted they can readily tell it and make proper adjustment.

Another advantage gained by having the foreman mark each tie with a piece of chalk is that he can then personally see and mark his ties so that the heart of the tie will be down and the good ends where they should be. This is a matter of more importance than probably most foremen appreciate.

USING A MOTOR CAR FOR PUMPING.

In putting down a concrete cesspool into a formation of quicksand at Missouri Valley, Iowa, on the Chicago & North Western, the small steam engine which was being used to run a 4-in. centrifugal pump suddenly went to pieces. No other motive power was available, and as there was a small motor car not in use at the time, it was quickly arranged to put this in place of the defunct steam engine.

The car had a 6 h. p. vertical engine connected to the front wheel of the car by a chain drive. A piece of ⅛-in. steel 6 in. wide and ⅛ in. shorter than the circumference of the track wheel at the base of the flange was obtained. This was put through the rolls in the boiler shop and bent to form a cylinder, and joined by a lap joint with countersunk outside rivets. This cylinder was forced on the driving wheel to form a belt wheel. The car was run up to and lined with the pulley on the 4-in. centrifugal pump and shored from the pump foundation and the engine started. The delay to the gang on the excavation was not over five hours.



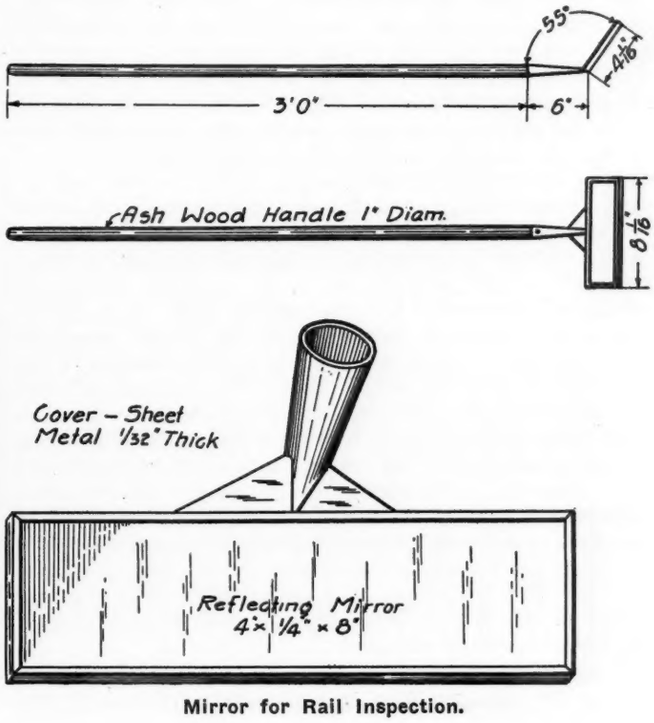
Using a Motor Car for Pumping.

USING NATIONAL JEALOUSIES TO PROMOTE LABOR EFFICIENCY.

The general foreman in charge of the track forces during the construction of the Baltimore & Ohio yard at Chicago Junction, Ohio, secured very good results by mixing nationalities of his forces. Although a force of about 260 men was employed he recruited his labor from as many different nationalities as possible and tried to have but one gang of any one nationality. By working a gang of one nationality beside a gang of another race he was able to maintain a spirit of rivalry and increase the output of work. If he told a gang of Italians that if they did not do better work he would bring in some Austrians, he made it a sort of national issue with these men, and each gang worked harder than usual to outdo the others, because of their national hatred of each other. Probably the greatest benefit was in the elimination of serious labor difficulty and securing a closer control over the man. There was no danger of a serious walkout, as might occur if all or a large proportion of the men were of one nationality, for if one gang struck or was discharged, no men of any other race would go out in sympathy with them. In this way the general foreman was able to enforce better discipline than if he had had continually to fear that his men might go out at any time.

MIRROR FOR RAIL INSPECTION.

On one of the large railway systems which is making a careful study of its rail failures, instructions were issued to division engineers to have all rail then in track inspected to determine its condition. Since many rail failures occur at the junction of the head and web, to make a thorough inspection it is necessary for the inspectors to get down low enough to enable them to look up at the under side of the head. To avoid this very slow and laborious work, some of the men employed in this inspection devised a method for making this inspection while standing erect. A mirror 4 in. x 8 in. protected around the edges by a 1/32-in. sheet metal cover was attached to a wooden handle 3 ft. long. By holding this mirror along the rail the inspector can see in it the reflection of the under side of the rail head and note its condition.



Mirror for Rail Inspection.

METHOD OF APPLYING STONE BALLAST.

BY M. JOYCE,

Roadmaster, Chicago & North Western, West Chicago, Ill.

All the old ballast should be removed as far as to the bottom of the ties, between the tracks and to the outside edge of the track shoulder. This old ballast should go towards widening narrow embankments and raising side tracks. All band ties should be removed. Great care should be taken that all ties be properly spaced and straightened so as to have an equal bearing under the rails. All track dug out should be filled in with the new ballast every day to prevent the possibility of it getting out of line in its skeleton state.

The amount of ballast dumped should be regulated to suit the

raise, and both grade and center stakes should be furnished in every case, and no less than eight inches of stone be placed under the ties at any place; except at approaches to permanent structures, such as bridges, which cannot be raised. Track should be lined to center in every instance after the first raise. The proper dumping and distribution of the ballast is a very important factor in the saving of labor in carrying out the work in general. It should not be necessary to borrow or handle any surplus stone by reason of improper distribution.

A gang of men composed of a foreman, a track raiser and 32 laborers on the first raise should be able to put up 4,000 ft. of track daily with a raise of from eight to ten inches. This work is carried out in the following manner:

Using two track jacks to get the track to grade on the first raise, the stone is shoved equally under that part of the tie under the rail and outside, doing little or no tamping whatever. The track is filled in between the rails from the dump cars the same day the track is raised to prevent it from settling too much. The traffic passing over the tracks will pack the ballast much better than tamping picks on the first raise and by so doing a large amount of labor will be saved. There is no possibility of the rails getting bent; in fact it has been found that track put up on the first raise in this way settled more evenly than track of the same character tamped with tamping picks.

After a period of ten days it will be found that this track has settled about two and one half inches under heavy traffic and is ready for the second raise. In this raise the surface and level should be made as perfect as possible and that portion of the tie under the rail, all that outside and about one foot inside should be tamped solid with the tamping picks. It is not advisable to tamp the tie through, except that portion mentioned above, because the track will get center bound and out of line in the course of three or four months. The ballast will settle enough at this point to answer the requirements. A foreman, a track raiser and about 32 laborers should comprise the gang on the second raise. The amount of track this gang should raise each day should average about two thousand feet with proper distribution of the stone. The dressing gang should be composed of a foreman and about twenty men; if possible these men should be left permanently at this work as the longer a man is at this class of work the more he can accomplish. This gang should be able to dress about 1,500 ft. under fair conditions if the stone is properly unloaded.

DEVICE FOR UNLOADING RAIL.

BY M. GANLEY,

Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

The following device has been used with good success to prevent damage to rail in unloading. Cut 12 or 15 in. out of the base in the middle of an 18-ft. piece of rail. Bend the rail where this piece has been cut out so as to form the letter A, then bend 12 in. at each end of the rail so as to form a sort of runner. Two heavy plates 12 in. long and 8 in. wide should be riveted on the base of this rail at such points that when this A is hung on a pin in the drawbar of the car, the knuckle having been removed from the drawbar and a round pin with a high head on it inserted, and the two ends of the rail are resting outside of the track rails, these riveted pieces form slides on top of the track rails. Two pieces of rope 18 to 20 ft. are required, each with a hook in one end to place in the bolt hole of the rail being unloaded and with a loop on the other end for a man to put a bar through and hold against the tie. As the train moves forward a rail length the rail is pulled out of the car and drops on to the A rail, sliding down it clear of the main track. The train then stops until a new hold is secured on another rail, when the operation is repeated. It is possible to unload from 7 to 16 cars of rail per day by this method, according to the amount of traffic that is being moved. Two men are required at each end of each rope with six men in the car and two men following up with lining bars adjusting rail.

EDUCATIONAL WORK IN THE TRACK DEPARTMENT; UNION PACIFIC.

The educational work being done by the Educational Bureau of Information of the Union Pacific is of special interest to maintenance of way men, for an important part of the work of the bureau is devoted to the employees of the track and signal department. In no other department has labor deteriorated so much, and nowhere else does the need for improvement exist to such an extent as in the track department.

The Educational Bureau was organized in September, 1909, and its purposes and methods were fully described in the *Railway Age Gazette* on September 3 and November 26, 1909, and June 10, 1910. Up to the present time 30 courses of instruction have been prepared and over 3,000 students have been enrolled, although up to December 15 of last year no attempt was made to increase the enrollment, except by issuing formal announcement at the time the bureau was organized. Students who are too busy with their regular work to prepare their lessons promptly are given all the time they desire to enable them to qualify on advising the bureau to this effect. This is frequently necessary with track foremen who find it difficult to make much progress during the summer months, when their gangs are large and the night labor they have to do on time rolls and reports is heavy. Opportunities are offered those employees already having a good education, such as technical graduates in the engineering or motive power departments, to take courses in the operating or other departments, or courses in advanced reading are arranged.

The different lessons are prepared under the supervision and with the aid of the department for which they are intended, in this way embodying the standard practice of the Union Pacific. The student knows that the methods outlined in these courses are the approved ones on his road and show him the way he should do his work. For this reason these courses have an added value to the employee over any course or books written for general use. The track papers were first written by the division engineers and assistant division engineers (general roadmasters), and after being very thoroughly discussed by them, were submitted to other track men and engineers for criticism. As they finally appear they represent the result of a number of men's work. They are written in simple language that any one with an elementary education can read and understand, special attention being given to the adopted viewpoint of the student in the preparation of the lessons.

The lessons are printed in large, clear type on a heavy white paper, and are bound with a brown paper cover. Each consists of from 20 to 40 pages, 8 ins. by 10½ ins. in size. The text is fully illustrated with views showing the work being done according to the approved practice so that the student can see for himself as well as study from the text.

The track course is divided into nine lessons, eight of which are already prepared, and the copy for the last is now practically ready for the printer. These lessons are decidedly practical and give the student directions as to how to do the common track work. The first lesson is on track tools and describes the various tools and their uses and abuses. This is followed by a lesson on the book of rules for the maintenance of way and structures. The third lesson is on ballast, and gives a description of the various kinds of ballast used on the Union Pacific with the qualities of each, and the proper handling of it on the track. Instruction is given regarding unloading it, raising and dressing the track, and the size of gangs necessary.

Following this is a paper on ties, giving the kinds of ties used and general instructions for handling and renewing them. Rails and fittings are discussed in the fifth paper, in which the proper methods of loading and unloading rail and relaying it in the track are discussed, and instructions are given on methods of figuring the amount of material needed for any piece of work.

The next lesson is on the maintenance of roadway and track, and covers the common duties of the track laborer in seasonal

sequence as far as it is possible to do so, starting with the repairing of all tools and the opening of ditches in the spring and touching on the other duties as they develop through the season. The more special problems, such as the maintenance of tunnels and station grounds and the handling of snow, are covered in the next lesson, while the eighth paper gives instructions on the laying of new main or second track, from the unloading of the material to the ballasting.

The last paper in the course, now nearly ready, will be on crossings, frogs and switches.

In addition to these nine lessons, the track course includes one lesson from the accounting course on the section foreman's accounting for labor and material, one on the use of the employee's time card, and one on signals. Another paper will soon be prepared for students in both the track and signal courses on gas engines, for the benefit of the men using motor cars. A course is also being prepared on reinforced concrete construction for the instruction of the bridge men both in the office and field. In addition to the track men those desiring the civil engineering course are required to take the track course as preliminary preparation.

Upon completion of the track course most of the men will take up the block signal course, which consists of about 33 lessons. The first three lessons describe the types of signals in use on the Union Pacific and explain their operation. The next 12 papers are on electricity and magnetism, which are treated in a simple way. The remainder of the course deals directly with the signals and signal appliances in use on the Union Pacific.

A large number of track men have already completed all the lessons ready in the track course and started on the signal course. As track work and signal maintenance are so closely related, this block signal course will be of great value to the section men. On one roadmaster's district the section forces have already taken over the work of the signal maintainers, and the double track automatic block signals are now maintained by section forces.

The track course has been translated into Japanese for the benefit of the 600 Japanese in the track department and a special branch of the bureau is maintained for their benefit at Cheyenne, Wyo., where all these students are enrolled. Here the students may send in their replies in Japanese if they prefer, many of them being unable to write English. Some of the lessons are printed in both English and Japanese in the same book, the same material being placed on facing pages, so that the student may learn English while studying his lesson. The Japanese are among the best students enrolled, and the proportion of them taking the course is large. It is also planned to issue the Book of Rules in Greek soon for the use of the employees of this nationality, of whom there is a large number on the track.

In the preparation of the track and block signaling courses the mathematics necessary have been given to the student only as he needs them to pursue his studies, instead of being given to him as a complete course before being allowed to take up his other work. In this way the student's interest in the course is maintained and at the same time he gets full value out of his mathematics by studying them as he actually needs them. In the preparation of the lessons it is assumed that the student has a knowledge of addition, subtraction, multiplication and division, but no more. He requires no further mathematics for the completion of the track course; it is not until he reaches the seventh lesson in block signaling that he needs any more. At this point he encounters a problem involving the area of a circle. If he sticks at this point, the first mathematics lesson dealing with the properties of the circle is sent him to study. After completing this he is able to proceed in the signaling course until he meets with a problem involving squares, when the second mathematics lesson is sent him. If he can handle these problems without the lessons he is allowed to proceed.

The total number of men enrolled in the bureau to June 1, exclusive of Japanese, was 2,833, of which number 640 have left the service, leaving 2,193 students enrolled and in service. Of this number 376 are delinquent, leaving 1,817 or 82 per cent. enrolled and in service in good standing, comparing very favorably with commercial correspondence schools, where the average percentage in good standing is said to be about 40 per cent. These students are sending in about 1,050 answers to lessons per month. In addition, from the 600 Japanese employees, of whom over 80 are section foremen, over 160 are enrolled as students in the Japanese department.

A study of the first 1,800 enrollments in all courses, exclusive of the Japanese students, was made in February and showed the following percentages of Education Bureau students to all employees in the various departments:

	Percent.		Percent.
Engineering Department	13	Trainmen	6.5
Accounting Department	20.5	Motive Power Department	5
Station Service	13	Track Department	16
Engineers and Firemen	6.5	General Office Clerks	27

This showing of 16 per cent. of the track men enrolled with the bureau is remarkable when one considers their general lack of education, and that many of them are foreigners other than Japanese who, owing to their deficient knowledge of English cannot avail themselves of the advantages of the Educational Bureau. Out of 132 signal maintainers in service at the time of this report 84, or nearly 64 per cent. of those in the service, were taking courses. A further study of these first 1,800 enrollments gives the following additional data:

Class of Employees.	Percent. of Total.	Percent. in Good Standing.	Average Lesson Papers Answered Per Man.
Engineers, firemen, conductors, brakemen, operators and shopmen	23.2	70	6.9
Station men, including clerks (not including operators)	16.0	77	5.7
Division clerks	10.6	84	6.8
General office clerks	10.1	76	6.4
Track men	9.4	73	6.8
Signal men	8.5	83	8.0
Accounting department clerks	8.1	77	3.9
Officials	7.7	90	6.6
Engineering parties	2.2	77	9.6
Shop apprentices	2.0	77	8.3
Draftsmen	1.2	73	9.3
Bridge and building men	1.0	63	3.2
Grand total	100	76	6.9

Some question was raised as to how the union men would regard this educational work. It is worthy of note that the labor union men form 23.2 per cent. of the total enrollment.

A very important consideration in this work is the low cost at which it is being conducted. Even with the large amount of preparatory work which is being done, the total cost will approximate but about $10.00 per student for this year, which is very low when compared with any other similar work.

Conversations with some 20 section foremen distributed over 150 miles of track disclosed the fact that a majority of them are taking either the track or signaling course and others expect to begin in the near future. A number of these foremen also point with pride to men in their gangs who are also carrying on studies. However, owing to the fact that almost the entire force of laborers is composed of either Greeks or Italians and that few of these men can read English, it is impossible for many of them to carry the courses. The fact that so many section foremen, many of them beyond middle age, are studying their lessons after working hard all day on the track, is evidence of their belief that they are getting benefits from their courses. The knowledge of the men that the railway is providing these courses for their benefit cannot fail to create a spirit of loyalty and at the same time awaken ambition to do better work. The roadmasters say they can notice the effect of the courses in a decided improvement in the work of the foremen, while on the one district where the signals are maintained by the section forces, a number of the foremen said they would not have been able to do this work without the aid of the block signal course.

The benefits of the courses are not confined to those studying in their own line of work, for any employee can take any course he wishes if he is able to pursue the studies to advantage, and the services of the bureau are for the benefit of any student who

may desire to prepare for another department. For instance, one section foreman is studying to be a fireman, while another is taking a course in railway operation, desiring to become a brakeman.

We are indebted for the information in the foregoing, and for opportunities afforded for studying the work of the bureau, both in the office and on the track, to D. C. Buell, chief of the Educational Bureau of Information.

KINDS OF WOOD BEST ADAPTED FOR CROSS TIES.*

BY F. J. ANGIER,

Consulting Timber Treating Engineer, Chicago, Burlington & Quincy.

The demand for cross-ties is steadily increasing; the supply is as steadily decreasing. With the supply of the standard white oak tie nearly exhausted, the question is—where and from which kinds of wood is the ever increasing demand to be met? In 1900 first-class white oak ties were bought about 50 cts. each; today they are costing about 80 cts.

The railways of the United States require annually upwards of one hundred million ties for renewals. The Burlington alone uses about three million each year, and these cost approximately $2,000,000. In a statement made recently by W. F. Goltra, tie agent of the New York Central Lines, he shows that cross ties represent 8 per cent. of the cost of all material and supplies used by the New York Central Lines for maintenance, and that the increase in cost of ties in eleven years has been 53 per cent.

No doubt the time will come when there will be a satisfactory substitute for the wooden tie. It may be made of iron or steel, or of concrete, or of a combination of these; or, it may be possible to make it from corn-stalks, or of some substance which can be grown in a single season by the farmers of the country. No substitute now known can be called a complete success. The railways are still using the wooden tie, and doubtless will continue to do so for a number of years to come.

The inferior oaks, which a few years ago were hardly considered at all for cross ties, are now made as good, or better than the old standard white oaks, by giving them a preservative treatment. The first cost of the inferior oaks, plus the cost of treatment, is even less than the present cost of white oak. What is true of the inferior oaks, is also true to a greater or less extent of many other kinds of wood, among which might be named the beech, hickory, elm, maple, pine, fir, birch, hemlock, and tamarack. Our knowledge of wood preservation has advanced far enough for us to say absolutely that these woods can be chemically treated and made to last many years beyond their natural life. We can now treat a tie so that it will resist decay for 10, 15, 20 or more years, but it is certainly unwise to spend one cent more than is absolutely necessary to preserve the wood from decay beyond its mechanical life. If a tie will be destroyed by rail and spike wear in ten years, we surely must not use a preservative treatment to prolong its life for fifteen years. If better mechanical appliances could be employed, such as screw spikes, and possibly larger tie plates, and if more care could be taken as to the drainage of roadbed, and proper selection of different kinds of wood for use under heavy and light traffic, the mechanical life could be materially increased, and the timber treating department could meet this by preserving the tie so it will resist decay for the increased period.

Up to a year ago all treated ties, with the single exception of oaks, were shipped out as soft woods and were used indiscriminately in the track. This meant that pine, cottonwood, poplar, soft maple, etc., were used with the harder woods. Beech, hard maple and hickory have greater spike-holding power than white oak and it seems nothing less than inexcusable ignorance to place ties made of such wood in side tracks, and to put the soft woods in main line. I am glad to say that this practice is rapidly being done away with on the Burlington.

*Read before the annual meeting of the Burlington Association of Operating Officers.

Through our endeavors of the past year or two we have learned of many of the characteristics and properties of the woods we purchase for cross ties, and under date of March 15, 1909, the general managers issued a circular classifying our ties as "hardwoods" or "softwoods." All ties shipped from the treating plants are now loaded in separate cars and billed out as "hardwoods" or "softwoods," and in addition every tie has stamped on the end a large letter "H" or "S," which is to designate "hardwood" or "softwood." With this arrangement there should be no excuse for mixing them in the track.

You may be interested to know how our classification was made. For the past two or three years many thousands of ties, comprising about twenty-five kinds of wood, have been treated in the experimental laboratory at the Galesburg plant. The specific gravity and density of the woods were determined, as well as other properties. In addition to our own experiments it was desired to get the opinion of our experienced men as to the rail resisting and spike wearing properties of different kinds of wood, and the following letter was written to every division superintendent, roadmaster, and to many other officials on the Burlington, as well as to managers of timber treating plants on other roads:

"The attached list shows the principal kinds of wood used for ties on the Burlington system. There is quite a difference of opinion as to which will be classified as hardwoods and which softwoods. From a commercial point of view all broad leaf trees are considered hard woods, and all needle bearers are considered soft woods. This would throw out such woods as pine, cedar, fir, hemlock, tamarack, etc., in the soft woods and the oaks, beech, hickory, ash, elm, maple, etc., in the hard woods. However this classification does not answer our purpose. We wish to classify these woods as to their rail and spike wearing qualities. In other words we wish to know what kinds of ties you would order to put on a curve where you wish to have the greatest spike holding power, and the least cutting by the rail. The beech tie is probably just as good or better than a red oak tie for this purpose, and there are perhaps other woods, such as hickory, and perhaps hard maple, which you could not hesitate to put on a curve. In order to get the opinion of as large a number as possible who have had years of experience along this line, you are requested to make a cross in one or the other of the last two columns on the attached sheet giving your ideas as to what you would call a hard wood tie and a soft wood tie."

Fifty-two replies were received. These were carefully tabulated with the results given herewith in Table 1:

Table 1.—Classification of Ties.

Kind of Wood.	Percentage Received at Galesburg Tie Plant.	Classification.	Summary of Replies to Circular Letter. Hard.	Soft.	Don't Know.
White Oak	.26	Hard	52	..	..
Red Oak	44.52	"	49	3	..
Pin Oak		"	51	1	..
Beech	6.65	"	41	8	3
Hickory	1.05	"	51	..	1
Ash	.86	"	39	10	3
Hard Maple	3.48	"	47	3	2
Soft Maple		Soft	7	43	2
Slippery Elm	5.54	"	18	32	2
White Elm		"	18	32	2
Birch	.85	"	20	26	6
Chestnut	Not treated	"	18	32	2
Tamarack	.24	"	2	47	3
Hemlock	2.25	"	..	49	3
Tupelo Gum	19.49	"	2	42	8
Red Gum		"	6	38	8
Red Fir	Used only at Sheridan Plant	"	3	46	3
Loblolly Pine	8.54	"	1	48	3
Lodgepole Pine	Used only at Sheridan Plant	"	..	49	3
Sycamore	.16	"	4	44	4
Cedar	Not treated	"	..	..	..

This shows that the majority of our superintendents, roadmasters and others, classify the oaks, beech, hickory, ash and hard maple as hard woods, and the balance as soft woods. It has been argued that some of those to whom the circular letter was sent were not familiar enough with the different kinds of wood to make a classification along the lines suggested. This

may be true, and some replied that they did not know about certain kinds of wood, and in all such cases the replies were either omitted entirely or placed in the column, "don't know." Many of the answers received were from men of long experience in railroading, and who have had practical experience in the use of timber and ought to be in a position to know. From a more theoretical point of view, Table 2 will show the spike holding power of different kinds of wood. Some of these tests were made at the University of Illinois, and others in our own laboratory at Aurora:

TABLE 2.—HOLDING POWER OF SPIKES.

Kind of Wood.	Maximum Resistance in Lbs. Pull.		Resistance in Per Cent. of That of White Oak.		Where Test Was Made.	
	Untreated.	Treated.	Untreated.	Treated.		
White Oak	7,870	.....	100	...	University of Illinois	
Water Oak	.....	6,780	...	86	"	"
Black Oak	.....	7,230	...	92	"	"
Red Oak	6,460	7,730	82	98	"	"
Burr Oak	.....	9,210	...	117	"	"
Ash	.....	7,730	...	98	"	"
Chestnut	5,190	5,200	66	66	"	"
Elm	7,290	7,500	93	96	"	"
Beech	8,180	8,900	104	113	"	"
Poplar	4,920	5,670	62	72	"	"
Loblolly Pine	3,630	4,210	46	55	"	"
Sweet Gum	5,040	5,300	64	67	"	"
Hemlock	5,633	4,200	72	53	Aurora Laboratory	
Soft Maple	6,513	5,887	83	75	"	"
Hard Maple	10,177	8,960	129	114	"	"
Hickory	10,153	10,433	129	133	"	"
Cypress	3,163	2,840	40	36	"	"
Birch	6,337	5,907	80	75	"	"
Cottonwood	2,810	2,743	36	35	"	"
Northern Hard Maple.	10,393	.....	132	...	"	"
White Cedar	1,467	.....	19	...	"	"

These tests, very largely, bear out our classification. Two exceptions, however, have been made by our purchasing department, viz.: elm and chestnut are classified as hard woods. The classification in use now is as follows:

HARDWOOD TIES.

For use without treatment: White oak, burr oak, chestnut, locust, black walnut, mulberry, sassafras.

To be treated: Red oak, black oak, pin oak, water oak, turkey oak, Spanish oak, blackjack, beech, hickory, ash, elm, hard maple, cherry.

SOFT WOOD TIES.

For use without treatment: Cedar and cypress.

To be treated: Shortleaf pine, loblolly pine, bull pine, lodgepole pine, douglas fir, tamarack, hemlock, gum, tupelo, birch, sycamore, soft maple, hackberry, butternut.

ADDITIONAL MOTOR CAR DATA.

Since the publication in our issue of May 19 of the tabulation of data collected concerning the use of motor cars for section forces, information has been received from the Chesapeake & Ohio and the Missouri, Kansas & Texas.

On the Chesapeake & Ohio no section motor cars are used, but 14 Fairbanks, Morse & Co., and 8 Buda inspection cars have been in service from three months to six years. The cost of repairs to these cars averages about $2.25 per month, the cars being kept in repair by the men who operate them. The cost of fuel averages about $1.80 a month.

On the Missouri, Kansas & Texas 32 Fairbanks, Morse & Co. inspection cars and one section car are in service, having been used from two to twelve years. The inspection cars are used by the roadmasters, bridge and building foremen, traveling storekeepers and division linemen. Repairs are made by company machinists and their cost averages about $4.25 per month. The one section car in service causes a saving of about 75 cents per day on a four-man, or $1.20 with a six-man gang, as compared with hand cars.

The Chicago Great Western reports a recent incident illustrating one advantage of section motor cars. Following a severe storm a short time ago about 170 miles of wires went out of service. With the use of motor cars the trouble was located at the different points and cleaned up in 45 minutes.

THE NEED FOR BETTER CONSTRUCTION OF SUB-GRADES.

BY EMMET KEOUGH,

Roadmaster, Chicago, Burlington & Quincy, Aurora, Ill.

Although our present methods of construction of new railway grades are in many ways superior to earlier construction and a great saving in time is made with modern improved machinery, it is doubtful if we find our modern tracks as easily maintained as were those built by earlier methods of construction.

In the days when grading was all done with teams, the dumps were fairly well settled as the dirt was put in place, and as the track was surfaced on dirt and filled in to a crown in the center of the track, the rain water was easily turned to the ditches or side of dump. Thus, there were no low spots or pockets in the center of the grade for water to stand in and make a soft roadbed.

It is found under modern grading methods, on account of the loose piling of the material in dumps and the application of ballast as soon as track is laid, that instead of a crown being formed in the center of the roadway to turn the water to the side ditches, the water which falls on the roadbed is actually pocketed in a basin at the bottom of the ballast. If the dirt is of the bad clay or vegetable variety, the water cannot penetrate the sub-grade to any extent but will lie there, keeping the surface of the sub-grade soft and making it difficult to maintain good track. On account of the track going down in such places it becomes necessary to add more ballast from time to time. It is generally found that these soft places appear here and there along the line even though the material composing the sub-grade is all alike. This is most likely due to the fact that the sub-grade was a trifle lower at these soft places when first constructed and certainly did not improve with age. In fact, experience shows that many roads find it harder to maintain certain pieces of track ten or fifteen years after the road is constructed than during the first year. This is generally attributed to our present heavy rolling stock, but the fact often is that the grade is actually in worse condition than when first put up, on account of the great holes in it at different places. These holes are generally irregularly shaped pockets under one or both rails. What were probably only small depressions when the road was new, are often found to be ten or fifteen feet in depth, extending fifty or one hundred feet along the roadway. Extreme cases cause an unusual bulging of the sub-grade at these places.

In some places (generally cuts) we find the cross section of roadbed in the shape of the letter "W." This is no doubt due to the fact that our trackmen in picking up these rough places in track, in their hurry to get over them, tamp only the ends of ties. This crowds the dirt toward the center of the track as well as to the outside with the above results as to contour of sub-grade. Such cases are found where the track is ballasted shortly after the track is laid. In all cases it is found necessary to add ballast often as the road gets older, although the actual elevation of track continues the same, the old ballast having been crowded down and out.

The result of such conditions is a continual fight to keep track in shape to prevent hard riding and accidents. After these places get to be three to five feet deep it is found that even frost is of little benefit, as the soft places are too deep to be affected and it becomes necessary to block up on top of ties to make the track passable. In fact, the actual cost of maintaining one good-sized slide is often more than that for an entire mile of track, to say nothing of the extra cost of derailments, etc., resulting from them.

There is another bad grade condition which causes an equal amount of trouble and generally is more dangerous, as it is found along bluffs and often around curves or along waterways, etc. This is a ledge of soapstone or other rock

in the sub-grade pitching at an angle of 30 to 40 deg. Track over such places is hard to keep in proper alinement and surface, as it often slips several feet in a short time. The writer has seen a few such places where the track would work out of line from a few inches to four or five feet each season. These cases are often considered incurable, little more being done than to have track men patch them up while sliding, maintain a night watchman and line back with an extra gang of men in the spring. It is only time and money wasted to be working "on top" of these places as the remedy is only temporary and the track is at all times dangerous, some of it exceedingly so.

The question arises as to how to make permanent repairs in such cases. This is being done to good advantage by different roads. It is possible to apply enough cinders, burnt clay or other porous material above the sub-grade to absorb any ordinary rain so that little or none of it will reach the sub-grade to soften it. This material can not always be had in sufficient quantities to obtain the results sought and the track cannot always be raised enough to allow this, and generally drainage is resorted to in the case of pockets in dumps. This is done in various ways. Some merely tap into the side of the pocket and fill in with rip-rap, cinders, tile, etc. This is generally found to help conditions, but is not a cure, as the water is drawn from a considerable distance on either side of the pocket, and the sub-grade is considerably softened while the water is slowly working along the grade to the drain. Probably the most successful method is to ditch lengthwise with the track along the ends of the ties, going down deep enough to tap the bottom of the deepest pockets. The ditch thus made can be filled with cinders or other porous material and a small tile can be placed in the bottom. The material should be well tamped to prevent the track from getting out of line and surface while the material is settling. This kind of a ditch not only taps the holes in sub-grade but prevents the water from entering the ballast which falls along the sides of the track, therefore reducing the surface area of grade top as far as water is concerned.

The case of sloping soapstone under the surface is best treated, where conditions will allow, by drilling into this material at the foot of the dump or fill fifteen or twenty feet away from the track, at intervals of every ten or fifteen feet along the line of the track. Blast this soapstone enough to break it up into a rip-rap effect. While this will not stop the slide at once, it will do the work as soon as the grade under the track slides down against the roughened surface of the broken stone. Such treatment has been successfully tried in a few places to the knowledge of the writer, and while very successful is also a cheap method.

The matter of good sub-grades is one of primary importance to the maintenance man, and should be given more consideration than mere time and yardage, as is generally the case. Where the dirt obtainable for sub-grades is porous, it is less important that extra precaution be taken to make a solid, well-drained grade. Where the opposite is the case much money can be saved for the operating department by paying special attention to securing proper compactness of the grade or to its drainage. Then, too, in the case of second or extra tracks it would be an easy matter to put in the tile as the grade is being built, as the extra top surface forms more area for water to stand in and softens the grade. Parting lines of old and new grades, as we all know, should always be broken along the old grade with a plow to allow union of the two grades, but the doing of this is the exception, rather than the rule.

Other forerunners of slides are the team ways made when a dump is being built, which are allowed to be filled out to full grade without breaking the hardened surface.

There are various ways of preparing a good sub-grade, any of which cost more than is generally considered customary for such work, but the time is rapidly coming when it will be found that it is necessary to give proper time and attention to building a good foundation, before we can expect first-class track.

PRESERVATION OF TRESTLE STRINGERS AND CAPS BY HOUSING.*

BY HUNTER M'DONALD.
Chief Engineer, Nashville, Chattanooga & St. Louis.

In 1893 the writer had charge of the renewal of a number of combination spans which had been in service about twenty years. The main and second braces and top chords were of yellow pine, and since their original construction all had been carefully covered with weatherboarding on the sides and tin on the tops, the latter carefully fastened to sheathing, with air space beneath, and soldered. All of the timber upon removal was found to be sound, and was used again for trestle stringers.

The value of such protection had been previously observed, and in 1887 the plan of protecting intermediate sills on double-deck trestles with sheets of galvanized iron was adopted. The

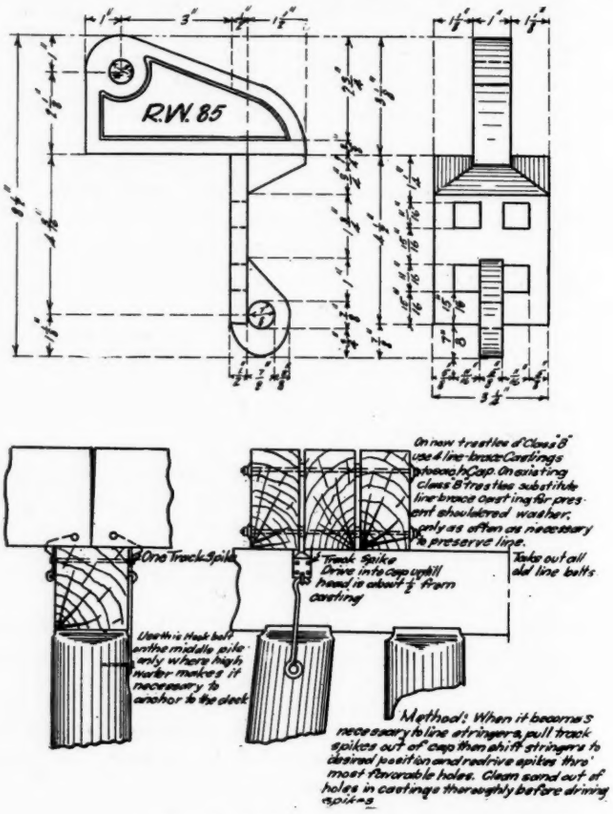

R.W. 85
On new trestles of Class 'B' use 4 line brace Castings above Cap. On existing Class 'B' trestles substitute line brace casting for present shouldered washer, only as often as necessary to preserve line.
One Track Spike
Track Spike Drive into Cap until head is about ½" from casting
Take out all old line bolts
Use this Track bolt on the middle pile only where high water makes it necessary to anchor to the deck
Method: When it becomes necessary to line stringers, pull track spikes out of cap then shift stringers to desired position and redrive spikes thro' most favorable holes. Clean sand out of holes in castings thoroughly before driving spikes

Fig. 1.—Line Brace Casting.

sheets extended about three inches over the sides and six inches over the ends, and the posts of the upper section were held in place by allowing the drift bolts, passing through the cap into the posts below, to extend about six inches above the cap, through the galvanized iron protection and into the feet of the upper section posts. In a number of instances the top caps were similarly protected about the same time.

The intermediate caps were found to be sound in 1906 when the trestles were filled. The top caps, although the housing had not been well maintained and the stringers rested directly on the galvanized iron, with drift bolts through it, did not require renewal until 1908.

About 1900 the writer had occasion to notice a large pile of

*From a paper presented to the Engineering Association of the South.

stringers which had been removed from the trestles on the Cincinnati Southern Railroad. These stringers were put in place about 1879, and had been protected with galvanized iron according to the designs of Mr. G. Bouscaren, chief engineer. The ties rested directly on the stringers, holes being made at frequent intervals in the galvanized iron in order to confine the ties to position. Col. G. B. Nicholson, chief engineer of the Cincinnati Southern Railroad, was present with the writer at the time these stringers were examined and told him that the galvanized iron had not been carefully removed as it rusted out, nor had any great effort been made to keep it from creeping or leaking. Trestles which were still covered were examined, and many leaks found in the iron and many sheets found out of position. The condition of the stringers removed showed remarkable preservation, rot occurring only in local spots—around bolt holes—and at points where the protection had been improperly maintained. This examination convinced the writer

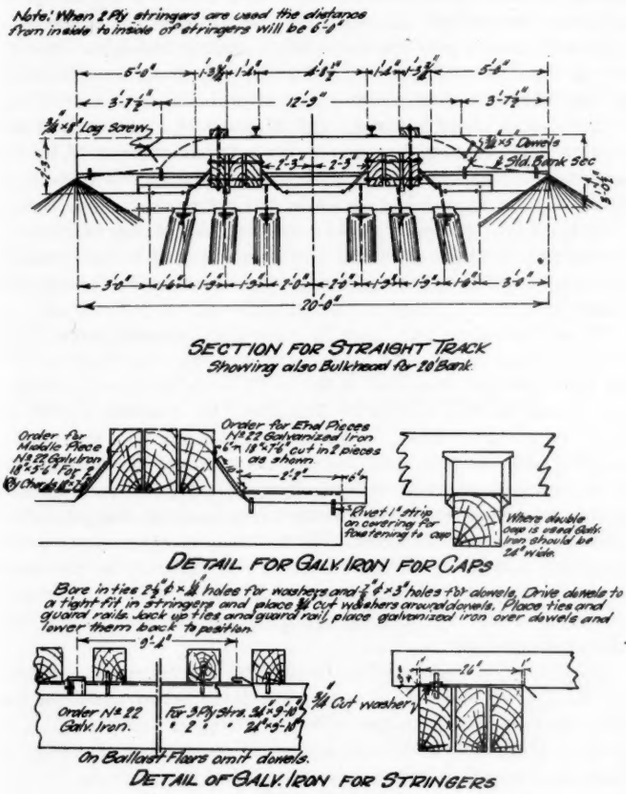

Note: When 3 Ply stringers are used the distance from inside to inside of stringers will be 6'-0"
5'-0"
3'-7½"
12'-9"
Log Screw
Old Bank Sec
20'-0"
SECTION FOR STRAIGHT TRACK
Showing also Bulkhead for 20' Bank
Order for Middle Piece
Order for End Pieces
Rivet 1" strip on covering for fastening to cap
Where double cap is used Galv. Iron should be 24" wide.
DETAIL FOR GALV. IRON FOR CAPS
Bore in ties 2¼"d × ⅜" holes for washers and ¾"d × 3" holes for dowels. Drive dowels to a tight fit in stringers and place ¾" Cut washers around dowels. Place ties and guard rails. Jack up ties and guard rail, place galvanized iron over dowels and lower them back to position.
Order No. 82 Galv. Iron.
For 3 Ply Strs.
For 2 " "
¾" Cut washer
On Ballast Floors omit dowels.
DETAIL OF GALV. IRON FOR STRINGERS

Fig. 2—Details of Housing—Open Deck Trestle.

that, whether the galvanized iron was properly maintained or not, the results obtained fully justified its use, and since 1900 stringers and caps when renewed on the lines under his charge have been so protected.

At that time the standard trestle consisted of two 8 x 16 stringers on each side, packed one inch apart, each pair being spaced six feet apart on the inside. The chords were confined to the caps by what were called "stag bolts"—that is, drift bolts driven slantingly through their sides into the caps. The ties were 8 in. x 9 in. x 10 ft., and each was doweled to the chord by ¾ in. x 5-in. dowels, two dowels to each tie passing into alternate members of the chord on each side. Holes were bored into the tie and the dowels driven in to a tight fit, the corresponding holes in the stringers being a loose fit. The guard rail was directly over the outside member of the chord. Two bolts to each span on each side passed through guard rail, tie, and stringer.

The galvanized iron was applied to the caps in the manner already described, and that on the stringers by jacking up the ties, the dowels following them, inserting the iron under them and lowering them again. The weight of the ties caused the dowels to perforate the sheet iron and settle snugly to place after a slight blow with a hammer. It was supposed that the dowels and guard-rail bolts would confine the iron permanently to position, but subsequent observation showed that the iron at many points crept, always outward, no matter whether on sharply elevated trestles or not. The creeping was very slow, and slots were torn in the iron by every dowel and bolt. Careful observations were made with a view of determining the cause of this creeping, but so far the exact cause has not been ascertained. No doubt it is due to different causes at different points. There are many trestles on which no creeping occurs, others where isolated sheets are found to creep, and others where nearly all the sheets creep. It is believed to be generally due to imperfect bearing of the ties on the stringers, longitudinal vibration of the structure, and vertical movement of stringers on the cap or caps on the piles. The problem of remedying this, and also the leaking of water through the dowel and bolt holes, has been continuously studied, with the result that the method of housing hereafter described has been adopted and has been found to be almost entirely successful, both as to leaking and creeping.

To dispense with the drift bolts through the stringers into the caps, which are not only destructive to the timber, but cause much expense in adjustment for line and surface, a malleable casting, called a "line-brace casting," has been devised. Its form and method of application are shown in Fig. 1.

The line-brace casting serves as a packing ring, and also as an anchor for the chord to the cap. The chord members are packed only one inch apart to prevent the nesting of sparrows between them.

The four holes in the bottom part of the casting admit of fine adjustment and shimming where necessary, new wood into which to drive the anchoring spike being always available. This device has been found after long test to be entirely effective, even where heavy floods have overtopped the trestle and deposited driftwood against and under it.

The covering of the cap, instead of being continuous over the entire length as formerly, is made in three pieces, flaps being turned up on the sides of the chords under the overhanging sheet-metal chord cover. Figure 2 shows the present standard open-deck trestle, and the details of the housing. These covers are fastened to the cap by nailing through strips of galvanized iron riveted to the underside of each cover piece at four points. This arrangement permits direct bearing of the stringers on the caps and ready removal of sheets for the purpose of adjustment. In place of two, the plans show three stringers on each side, which is now the standard on lines of heavy traffic. The addition of the third member to each chord was begun in 1905, and the iron applied in 1900 was found in many cases to be rusted out. The timber underneath the iron was found in as good condition as when covered in all cases where protection had been placed over new timber; but where timber had already been in place a few years before being covered the rotting begun in the open was found to continue under the cover. Upon removal of the covering all chord members beginning to show decay are marked with white paint on the underside and all defective coverings replaced.

In the present plan the dowels are driven to a tight fit into the stringer instead of the tie, thus perforating the sheet iron upward instead of downward. Before driving the dowels the holes are filled with creosote, which is allowed to soak in. It was found necessary, in order to secure perfectly cut holes in the iron, to cut the upper end of the dowel in a lathe instead of by shearing.

After many experiments to determine the best way to prevent leaking through the dowel holes, it was found that this leaking was generally due to the churning of the ties and to capillarity, and that shearing the dowels was sufficient.

The plan now in use is to bore, with an extension bit, a recess in the bottom of the tie concentric with the dowel hole

¼ in. deep and 2 in. in diameter. Before putting the sheet iron on the stringers cut washers 1½ in. in diameter are dropped over each dowel in the stringer. When the sheet iron is settled home by the weight of the ties, the washer forces it up into the recess in the tie, secures a better hold on the iron to prevent creeping, and to a great extent destroys capillarity by creating an open space instead of tight contact around the hole in the iron. The water must be forced up an incline in order to enter the hole.

The sheets of iron are connected to each other by bending and lapping and riveting at one point on each side of the joint where it overhangs the stringer. The sheets are ordered in such lengths as to bring the joints between instead of under the tie. This method has been found almost universally effective to prevent creeping, and has reduced the leaking very greatly. No remedy has been found for leaks around the guard-rail bolts, but all holes in the stringers are carefully plugged at the bottom after framing and filled with creosote, which is allowed to soak in.

It is still found necessary occasionally to stop creeping by bending the iron downward on the inside of the chord, nailing it to the stringer and flaring the lower edge of the iron to keep the drip off the sides. Small squares of galvanized iron or washers are used when this plan is resorted to in order to keep the nail heads from pulling through the iron.

The method of covering the caps has proved entirely satis-

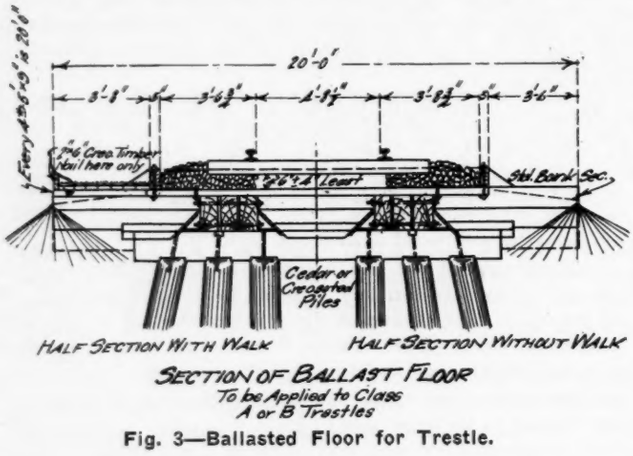


Fig. 3—Ballasted Floor for Trestle.

factory; gum and red-oak caps in use five years show no signs of decay. No caps put on since 1900 and properly covered have required renewal. Caps next to the bulkhead and those subject to frequent overflow on low trestles are of creosoted pine, as housing does not prevent decay in these.

When the use of sheet iron on the stringers was begun in 1900, no attempt was made to secure metal of great durability. Failure of many sheets appeared in about three years at points where switching was done or much sand used. Under ordinary road traffic it lasted about five years, and on branch lines of light traffic even longer. No failures of the metal on the caps due to rust have yet occurred. Later on effort was made to secure greater durability, and after considerable investigation it was decided to use a charcoal iron made by an eastern mill, the galvanizing upon which was found to be much heavier than on the ordinary galvanized (steel) iron purchased on the market. The difficulty with this iron was found to be that it would not stand short bending, the cracking causing leaks.

Attention having been called to the remarkable purity and claims for consequent durability of certain sheet metals manufactured by a new refining process, investigation was made of their qualities, and the results seemed to warrant the adoption of one of them, which took place in 1908.

Ballasted floors on trestles are meeting with much favorable consideration at present on account of the low cost of maintenance and decreased danger from fires, but it has not been heretofore considered advisable to use this plan without treating piles, caps and chords. On account of the success attained in the preservation of chords by housing, a plan for ballasted floor similar to that shown in Figure 3 has been adopted on the lines of which the writer has charge. The creosoted flooring on top of the stringers is confined to place by lag screws passing upward through a casting which also engages the packing bolts passing through the upper part of the chord. By this method all perforation of the chord covering is avoided. The chord covering can be renewed when required by jacking up the flooring from the caps below, and at the same time the members of the chord can be inspected on top. The cap covering is the same as for the open deck. This plan is much cheaper than one consisting of a larger number of creosoted stringers with planks spiked on top of them, and has the advantage of immediate conversion of present open-deck trestles to ballasted floors and admits of more ready inspection. It is believed to be able to take care of derailed equipment as successfully as any other plan. Driving spikes into creosoted timber penetrates the outer surface and admits moisture to the untreated interior, and will no doubt hasten the decay of the timber.

It requires seven and one-third square feet of the galvanized iron to cover caps and stringers for every lineal foot of trestle with twelve-foot spans. The best quality of iron will cost about .042 cents per square foot, or .308 cents per lineal foot of bridge. The labor cost for open decks, including the boring of recesses in the ties, is about .087 cents per lineal foot of bridge, making the total cost of covering per lineal foot of bridge about .395 cents.

If the stringers and caps of open-deck trestles were creosoted instead of covered, the extra cost for treatment would be about $10 per thousand, B.M., or 75 cents per foot of bridge. To secure the full benefit of treatment, the framing should be done in advance, which is often quite difficult, in view of the varying span lengths, and cutting has often to be resorted to. If not done in advance, decay is likely to set in. Assuming that creosoted stringers will last twenty years, and that the galvanized iron on untreated stringers will last only five years, it would seem the best policy to use the creosoted timber. On the other hand, the creosoted timber should be protected against fire, and a covering which will answer this purpose will also protect the timber from decay.

For ballasted deck trestles the protection from fire is afforded by the ballast, and for all new work there seems no doubt but that the best plan is to use creosoted stringers and caps. However, for present conditions, where all stringers are already in place and sound, it seems most economical to cover the present stringers and to continue to renew the covering until new stringers are required. All patching should be done with creosoted stringers. Just what effect the placing of the creosoted timber on top of the galvanizing covering is likely to have on the durability of the latter is a matter for future determination. It is also a question whether black iron painted with two coats of red lead applied immediately after mixing would not be more economical than the galvanized iron for the open-deck trestle.

SUMMER SCHOOL IN TRACK WORK.

The educational bureau of the Union Pacific has an agreement with the University of Cincinnati whereby a certain number of students in civil engineering spend four months each summer for four years as laborers in track work. The University of Cincinnati has specialized in this combined practical and theoretical training for several years, the mechanical engineering students spending alternate weeks in school and machine shop, working in the latter place as common laborers. This same plan is now being worked out for those civil engineering students desiring railway work. They spend the four months from June 1 to October 1 as laborers in the track department of the Union

Pacific, and work on a level with other laborers, drawing the same rates of pay and subject to the same discipline. Special provisions are, however, made for separate cars for them to live in. A four-year course is outlined, in which the students spend the first summer as laborers in either section or extra gangs; the following year they are made assistant section foremen on track work, while the third summer they work as chain men or rodmen in the engineering corps; in the fourth year they are allowed to specialize along the line of work they intend to follow, such as the track or engineering department.

Last year eight students came from the university. Four were placed in the yard gang in the Omaha yard, and four in the steel gang, the intention being to reverse them after two months. As an indication of the way in which the boys entered into the work, it is interesting to note that at the end of the two months when the boys were sent from the yard to the steel gang the foreman of the steel gang kept all of them, successfully standing off the instructions of his superiors and protesting that they were the best men he had in the gang, and that he could teach them as much as they could learn anywhere else. Seven of these boys returned June 1 of this year, six being made assistant foremen on the district where motor cars are used and where the section forces maintain signals, while one goes firing on a locomotive. In addition, six new students will start in as laborers in an extra gang. In this way at the end of the four-year course these students will have a practical as well as a theoretical training in railway civil engineering. This cooperative plan originated with Dean Herman Schneider of the University of Cincinnati, who worked in conjunction with D. C. Buell, chief of the Educational Bureau of Information, Union Pacific Railway.

INCREASE IN USE OF CREOSOTED TIMBER.

The approximate increase in the use of creosoted timber for ties and bridge material during the last four years is shown in a table included in the last volume of the proceedings of the Wood Preservers' Association, which gives the amount of each class of timber treated by plants in the United States during that period. The following figures are extracted from that table:

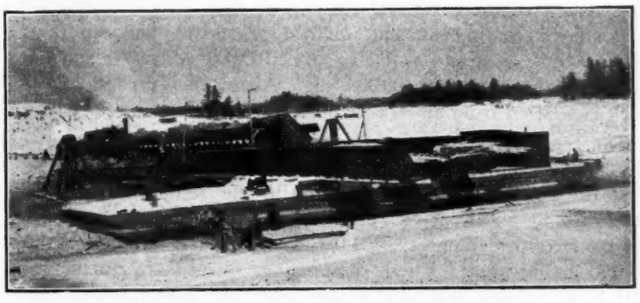
	Per cent. Increase, 1908 over 1907.	Per cent. Increase, 1909 over 1908.	Per cent. Increase, 1910 over 1909.
Creosote Treatment.			
Cross Ties	67	3	49
Piling	37	27	18
Bridge Timbers	20	135	1
Switch Ties	132	70	33
Bridge Ties	..	..	15
Zinc Chloride Treatment.			
Cross Ties	12	7	14
Piling	..	..	..
Bridge Timbers	53	..	..
Switch Ties	103	44	45
Bridge Ties	..	..	..
Zinc Creosote Treatment.			
Cross Ties	39	17	22
Piling	180	..	..
Bridge Timbers	..	..	..
Switch Ties	..	68	..
Bridge Ties	..	..	..

PROTECTION OF SHOULDER ON NEW EMBANKMENT.

The common practice of allowing surfacing gangs to dig into the shoulder of a new embankment to secure material with which to surface the track after this bank has been carefully brought to grade by the contractors is not allowed on the extensions which the Chicago & North Western is building in South Dakota. A line is carefully stretched along each shoulder of the embankment in advance of the surfacing gangs and the foreman is required to secure all material outside these lines. In this way the shoulder is maintained as built and does not require widening the first year or two.

RAINY LAKE REVISION OF LINE OF THE CANADIAN NORTHERN.

The Canadian Northern is now making a revision of its line across the "narrows" of Rainy lake near Fort Francis, Ont., which is unusual in several respects. The present line between Winnipeg and Port Arthur was built in 1900, being one of the first built by the Canadian Northern. It crossed Rainy Lake on a pile trestle two miles long. The bottom of this lake is similar in many ways to the muskegs so common in this section, and in building the trestles in this soft bottom many piles 80 ft. long were used, even these frequently going down one foot at the last blow of the hammer. In spite of these unfavorable conditions



Unloading Bridge from the Lake.

very little difficulty has been experienced in maintaining the structure, but it was necessary to take precautions continually to guard against trouble.

The greatest difficulties resulted from the ice. In the fall when the lake froze over the water was usually considerably above the late winter stage, and as it gradually fell it was necessary to keep the ice cut away from the piles to avoid its carrying them down with it and throwing the track out of surface. When the ice went out in the spring the side pressure was very great, although no actual damage from this source was met with until a year ago, when one section of the trestle was pushed quite badly out of line. While but comparatively little trouble had been met, there was always danger, and it was decided to build a new line on solid embankment when the trestle required renewal.

In making the location survey for this new line soundings were taken through the water and mud to rock over a large area adjacent to the projected line. This work was started during

Unloading Bridge.

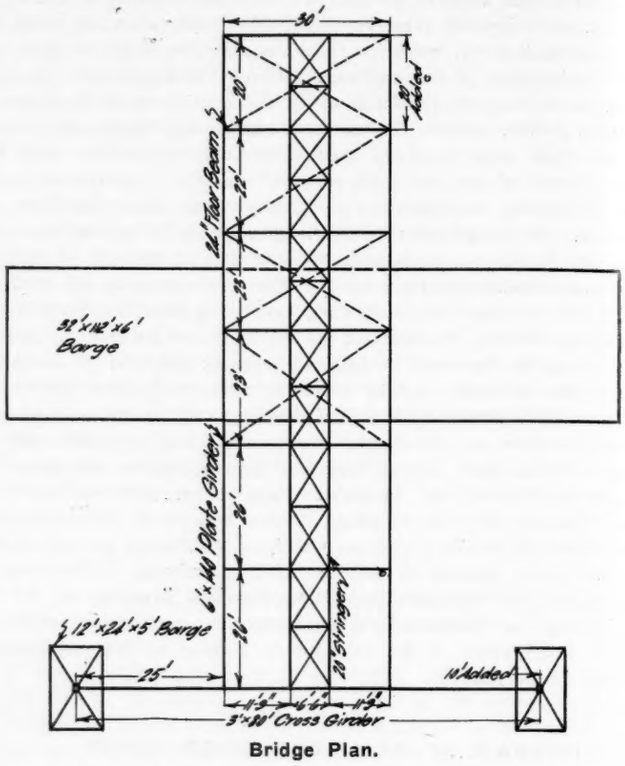
the winter but only fair progress was made. Much difficulty was experienced in driving down the sounding rods, as they became quickly coated with ice. The following summer the sounding was continued, a scow 22 ft. by 34 ft. by 2 ft. deep being used, on which a hand driver with 75-lb. hammer was erected. This scow had a well in the center, through which the sounding rod, composed of extra heavy 1¼-in. steel pipe in 10-ft. sections, was passed. Much more satisfactory results were obtained from this summer work than from soundings in the ice and better progress was made, a maximum of 28 soundings being secured in one day. The soundings were taken in water as much as 40 ft. in depth, while below these the mud extended to a maximum depth of

50 ft. over the rock. This mud varied from a soft ooze to a compact clay in which the sounding rod would penetrate but ⅛ in. with a 4 ft. drop of the hammer. Following the taking of the soundings a contour map of the lake bottom was made. By means of this map a new line was located over the summit of a submerged hill rising nearly to the surface of the water and at another place along a submerged side slope, very materially reducing the yardage. While introducing more curvature and lengthening the line about 900 ft., the new line was adopted because of the greatly decreased quantities of fill necessary as compared with any other line, and also to secure bridge openings at right angles.

The new line is 15,814 ft. long and provides two openings for logs and navigation; 800,000 cu. yds. of rock were required for a double track embankment, divided principally between three fills 1,000 ft. long and requiring over 100,000 yds. each and one 3,000 ft. long requiring 400,000 yds. About 95 per cent. of this rock is secured from an 80-acre borrow pit on an adjacent island.

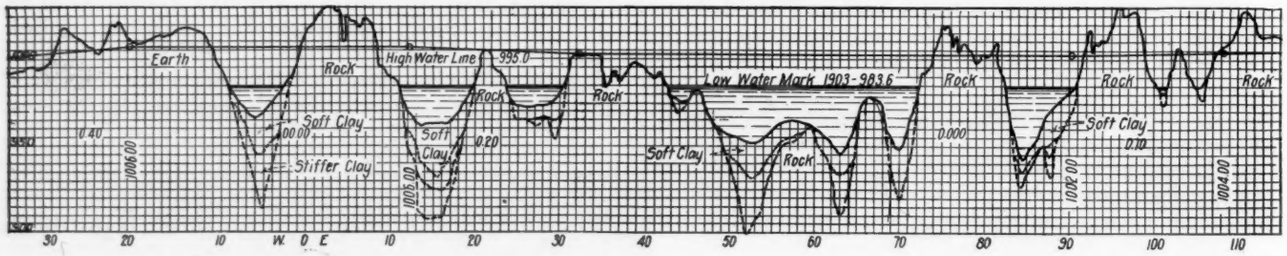
The contractors are using 25 tappet air drills for putting down the holes in the rock, these being drilled up to 30 ft. deep in the first lift and from 20 ft. to 25 ft. in the second lift. Air is furnished by a pair of "R. P. 2" type Canadian-Rand compound air compressors compressing 1,046 cu. ft. of free air per minute to 100 lbs. pressure. These compressors in turn are run by two 200 h. p. motors, securing power from the Rainy River Falls Development at Fort Francis, 2½ miles distant. The holes are heavily sprung and loaded with a combination of dynamite, virite and black powder, 300 shots being commonly fired at once. Two 95-ton Bucyrus shovels load the rock into 12-yd. standard gage side dump cars, which are pulled by four-wheel, 35-ton switching engines.

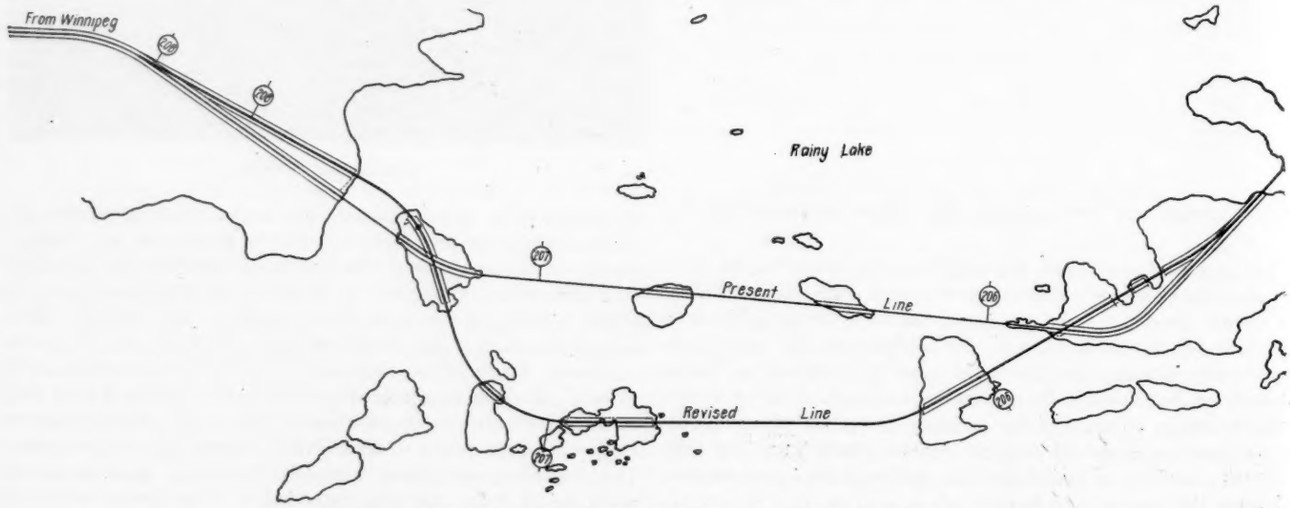
The contractor has devised an unusual arrangement for building the fills. The first fill was made in the ordinary way, by side dumping from a trestle and raising the tracks. A great deal of difficulty was encountered owing to the many heavy settlements of the fill carrying the trestle down with it. This settlement was especially severe in the shallow water, where there was much mud. To escape from the necessity of a trestle he placed two 6-ft. plate girders 140 ft. long across a barge 32 ft. by 112 ft. by 6 ft. deep, with one end of these girders resting on a 3-ft. plate girder 80 ft. long, which was supported in sliding braces on two smaller barges 12 ft. by 24 ft. by 5 ft. deep. The 6-ft. girders



Bridge Plan.

were placed 30 ft. center to center and were connected by seven floor beams 24 in. deep braced diagonally and spaced 20 to 23 ft., except at the two end panels, where they are spaced 26 ft. apart. On these floor beams two 20-in. stringers were placed spaced





Plan and Profile Rainy Lake Revision; Canadian Northern.

6 ft. 6 in. center to center and connected with double sway braces. On these stringers a standard gage track was laid extending on to the adjacent bank over two log stringers which reached over the end of the bridge. Cars are pushed out on to this bridge and dumped in the two shore panels. They are then pushed out on to the cantilever to allow others to be dumped, the cantilever acting as a tail track. As the two small barges at the shore end are placed at wide centers, the entire equipment can be pushed farther into the lake as the fill progresses. In completing the fill to grade it will be necessary to lengthen the cross girder, substitute larger barges for the 12 ft. by 24 ft. barges, and raise the entire bridge.

This arrangement has proven entirely successful, the only objection being that the 12 ft. by 24 ft. barges are not large enough and not far enough apart to enable the higher dump to be built at once. The barges are anchored to rock by steel cables and no difficulty has been experienced with the 3 ft. or 4-ft. waves which are encountered. To show the advantage of this floating equipment and the impracticability of filling from a trestle on this work, on one end of the 3,000-ft. fill 1,200 cars were dumped without moving the barges, the top of the fill repeatedly reaching the level of the girders and suddenly settling, leaving the bridge stringers in mid-air and forcing the mud to within 20 ft. of the surface in front of the barges where there had previously been 40 ft. of water. A comparison of the excavation and fill quantities has shown that the rock has settled to the rock on the lake bottom.

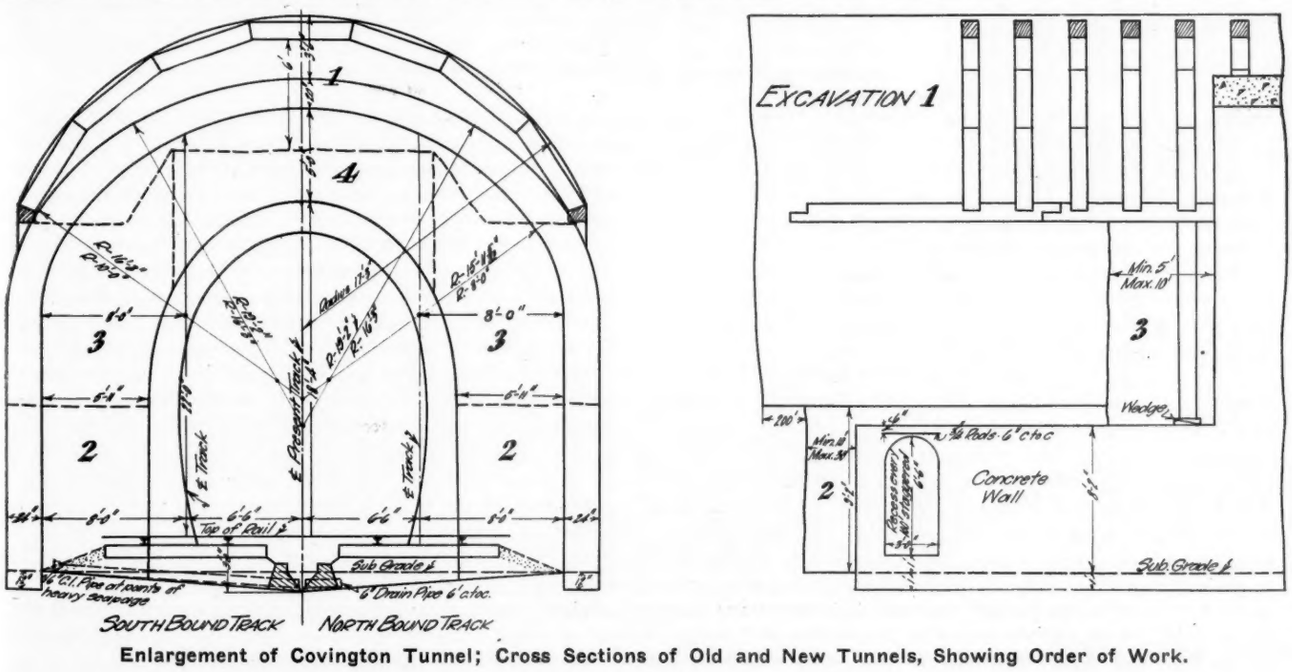
The contractors for this work are Johnson & Carey, St. Paul, Minn., who are working under the direction of W. H. Macleod, general manager and chief engineer of the Canadian Northern; W. L. Mackenzie, bridge engineer, and B. S. Remington, assistant engineer in charge of the work, to whom we are indebted for the foregoing information.

ENLARGEMENT OF THE COVINGTON TUNNEL.

The enlargement of the Covington tunnel, just south of Cincinnati, Ohio, on the Louisville & Nashville, was made necessary by the double-track work which the company is now doing from Cincinnati south. The Louisville & Nashville has two single track lines out of Cincinnati, its northern terminus. One, the Louisville, New Orleans & Memphis line, leaves the L. & N. and Pennsylvania union station, crosses the Ohio river on the L. & N. bridge, and runs southwest across the state of Kentucky. The other, the Cincinnati-Atlanta line, leaves the central union station, crosses the Ohio on the Chesapeake & Ohio bridge at a point about 1¼ miles west of the L. & N. bridge, and runs south by east, crossing the New Orleans and Memphis line at Latonia, Ky., four miles from Cincinnati. The traffic on both these lines is very heavy, but it is particularly so on that portion of the Atlanta line from Cincinnati to Latonia, since the company's terminal yards are located between these points, and, in addition to all passenger and freight movements on the Atlanta line, much of the interchange freight traffic for the Louisville line and a great many movements in and out of the yards are handled over this portion of the road. The scheduled movements alone number 122 in 24 hours.

In order to handle this traffic it became necessary to build double-track for a considerable distance south of Cincinnati, and as a step in this work, the single track tunnel at Covington, 3½ miles south of Cincinnati and a half mile north of Latonia, had to be enlarged to permit double track operation through it. The present tunnel is 754 ft. long, and is through a hill known locally as Kenton hill, in a thinly settled portion of the city of Covington. The north portion is very close to the south end of the Covington yard and from the south portal the track crosses a deep ravine on a heavy fill. The original tunnel was built between 1848 and 1852, by a railway corporation which by re organization became the Kentucky Central, and was lined with stone and brick.

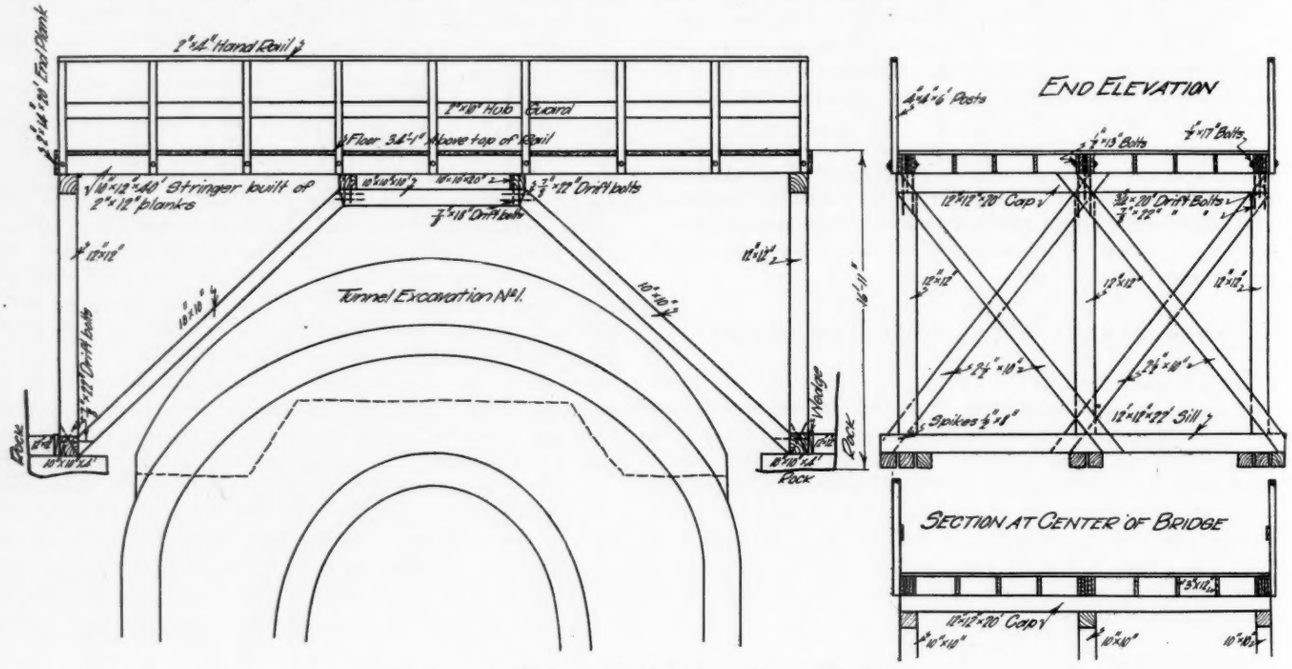
The work of enlarging the bore is being carried on without interruption to traffic, the order of work being approximately as shown in the drawing. At present the first excavation is completed. It is the intention to complete the excavation and place the new concrete lining before disturbing the old tunnel ring, and it is not expected that traffic will be interrupted even by slow order until the actual tearing out of the old lining is begun. The excavation in the top heading is carried on from both ends, soft slate being encountered for the greater part of the length and a stiff clay near the south end. This clay is loaded by shovels into small push cars which are run out to the portal and dumped down chutes into narrow gage cars on tracks on either side of the main track. The excavated material is carried out in these cars and used for widening the fill. The contractor has 12 men in the heading, two outside to dump the material, a foreman and a water boy. Working two shifts of 11 hours each, he drove 88 lineal ft. in working 27 days during March. The face of the heading driven has an average area of 8 sq. yds. The timbering consists of seven 12 in. x 12 in. arch blocks spaced 30 in. and 36 in. center to center and 2-in. lagging. For



Enlargement of Covington Tunnel; Cross Sections of Old and New Tunnels, Showing Order of Work.

a portion of the distance in the clay heading the lagging was driven ahead of the timbering. The clay was comparatively easy to handle when dry, but became very sticky when wet, causing the contractor considerable difficulty in timbering under a surface hole which was encountered in a season of wet weather. From the surface topography, it seems probable that this hole is at the end of the section originally built in open cut, or else is the result of a serious cave-in after the completion of the tunnel. The natural drainage of the surface water to this hole keeps the clay below it constantly wet, and it was a very difficult matter to support this weight of wet clay in the heading. A slight cave-in warned the contractors of the difficulty, but more serious trouble was avoided by adding intermediate arch blocks, so as to reduce the spacing to 18 in. center to center, and by adding a 3-ring arch below the other timbering for a short distance.

The Bank Lick turnpike crosses over the tunnel very close to the south portal, and in enlarging the bore, care was taken to prevent any sliding that would endanger highway traffic. This traffic was first diverted to the half of the road away from the tunnel portal, while two excavations were made in the other half of the road, in which to place the supports for a temporary



Temporary Highway Bridge Over Tunnel Portal.

bridge, as shown in the drawing. When this bridge was completed, traffic was turned over it and maintained on it until the excavation for the tunnel was carried well under the road. Traffic was then temporarily diverted to the half of the road that had been undisturbed, the bridge was removed, and the holes filled, restoring the road to its original condition. The danger of slides at this point was possibly not great enough to warrant the expense necessary to care for traffic as outlined above, but it served very well to allay any fears of the traveling public and did much to secure the good will of the local community.

The soft slate in the north heading is interspersed with occasional ledges of hard limestone 2 in. to 6 in. thick. This material is broken up by charges of from a half to one stick of 60 per cent. dynamite. The drilling is done with Howell's mining drills, operated by two men, or by Nixon ratchet drills, where it is necessary to drill in cramped positions. It has been found possible in this work to drill 2-in. holes in the slate at the rate of about 1 ft. in 2 minutes, but it is impossible to use the drills at all in the limestone ledges. The holes are drilled to a depth of about 5 ft. In "shooting down the face" it is customary to take out a vertical wedge in the center of the heading and then blow in the roof and sides. The rock is handled in two mule cars running on narrow gage tracks in the heading. The cars are equipped with detachable bodies which are picked up by a derrick just outside the portal and dumped into a chute having a capacity of about three cars of stone, from which the material is removed in dump wagons and used to fill a deep ravine on private property. The contractor uses 12 men and a foreman in this heading and four men outside, making a progress of 155 lineal ft, in 27 working days during March, and 160 lineal ft. in 25 days during April. The average area of this heading is 7½ sq. yds. Both headings are wired for electric light, power being secured from a local lighting company.

The engineer in charge for the railway is keeping a very complete and accurate record of the progress of the work in the tunnel. A rubber stamp, showing the outline of the 7-ring timber arch, is used to stamp the sheets on which the inspectors' record the measurements of daily progress. Horizontal and vertical measurements are taken at every joint in the timbering, and at other points where the outline is irregular. From each inspector's record a cross section is plotted in a standard cross section book, and from this the quantity of material moved outside of the ring is calculated. Accompanying each cross section, the total computed area outside the ring and the area of packing and "falls" are recorded. This area of packing and "falls" is obtained by subtracting from the total area the area of the cross section of the 2-in. lagging which is driven outside the arch ring. As the side drifts are excavated, similar cross sections will be plotted in the same book, so that when the work is completed each page will show the exact area of the section excavated at a given point. The progress profile of excavation along the center line in both headings is plotted each day, using the center rib of the timber arch as the base for measurements above and below. The portions of this profile that represent the work completed each month are colored to indicate clearly the general progress. On the same sheet with this progress profile is plotted a curve using lineal feet of heading as abscissae and elapsed time in days as ordinates. The slope of this curve representing the rate at which the work is progressing. The work is being done under the direction of W. H. Courtenay, chief engineer, and J. E. Willoughby, engineer of construction of the Louisville & Nashville, by Thrasher & Gunter, Chattanooga, Tenn. E. L. Trowbridge is the assistant engineer for the company in direct charge of the work. We are indebted both to the railway company and the contractor for the above information.

General News Section.

The New Jersey Legislature has passed, and the governor has signed, a law requiring railways to pay their employees twice a month.

According to an Arizona paper, the lines controlled by the Southern Pacific, in Mexico, suffered the loss of 200 bridges during the recent activities of the rebels in that country.

The hospital department of the Illinois Central, which has been in operation on the eastern lines of the road for a number of years, will from July 1 be extended over the entire system.

The Illinois railway commission bill recently passed by the legislature of that state, and outlined in the *Railway Age Gazette* of June 2, page 1287, has been signed by Governor Deneen.

The governor of Illinois has vetoed the bill which had been passed by the legislature, making the members of the State Railway Commission elective; but he says that the other measure, enlarging the powers of the commission, will have his approval.

The efficiency tests on the Pennsylvania Railroad now include inspection of the conduct of track repairmen, who are cautioned if they stand on a track while a train is passing (on an adjacent track); and if they walk on main tracks in the same direction as the current of traffic.

In San Diego, Cal., H. S. Heady, has secured a verdict in a local court for $171, being the amount of a month's salary, against the Atchison, Topeka & Santa Fe, on the ground that the road, in discharging him without giving him a hearing, had violated an agreement.

The Lehigh Valley is using Western Electric selectors for calling the different points on its telephone line in the Jersey City terminal freight yards, the yardmaster's office being equipped with calling apparatus like that used by train despatchers. In other words the yard telephone line is operated in the same way that a telephone train wire is operated.

It is claimed in Paris that Jules Vedrines, who recently flew from Paris to Madrid, attained, on one day, the prodigious speed of 155 miles an hour; traversing the distance from Dijon to St. Lauren—les-Macon—77.5 miles, in 30 minutes. He was pushed by a violent wind, which at times forced his machine into an erratic course, including frightful drops of a thousand feet.

With a view to impressing on its employees the importance to themselves and the company of their systematically keeping out of danger, the Atchison, Topeka & Santa Fe is holding at points along its lines where a considerable number of employees have their headquarters, a series of "safety" meetings at which addresses are being made by J. D. Hamilton, claims attorney of the road.

Pending the outcome of the 2-cent fare litigation in Nebraska, a written contract has been agreed to and signed by representatives of 13 Kansas railways, and the atttorney-general of that state providing for the continuation of 2-cent fares in Kansas for an indefinite period. If the cases in Nebraska are decided in favor of the railways, the Kansas roads will renew their contest for higher rates.

The Board of Public Utility Commissioners of New Jersey, having investigated the derailment at Martin's Creek on April 29, when eight or more persons were killed, finds that the derailment was due to imperfect track; the outer rail of the curve having been left insecure, so that the proper super-elevation was not maintained. Repairmen were at work on the track up to a short time before the derailment occurred. The commission finds also that no flagman was sent out to warn the approaching train to reduce speed.

Figures compiled by H. G. Askew, a statistician representing 32 of the Texas roads embracing approximately 93 per cent. of the mileage in the state, show that during the nine months ending March 31, 1911, the operating revenue of the roads was $80,208,710, an increase of 5.84 per cent. over the corresponding period of the previous year, while the total operating expenses aggregated $60,270,180, an increase of 7.83 per cent. After deducting operating expenses and making expenditures amounting to $23,995,700 from total operating revenue and all other receipts a deficit of $2,293,899 was shown.

A special demonstration train, called the "reclamation special," carrying lecturers representing the U. S. Reclamation Service and the Geological Survey, was sent out from Chicago on June 14 by the Illinois Central for a trip over the lines of that road and the Yazoo & Mississippi Valley in Kentucky, Tennessee, Mississippi, Alabama, Louisiana and Arkansas. The train will make stops at 61 cities and towns, where lectures will be delivered, and a study will be made of the swamp country with a view to determining the best method of draining it and disposing of the water to greatest advantage.

In Massachusetts a law has been passed requiring railways to extend the term of season tickets when a passenger desires to take a vacation of a week or more. The passenger must deposit his ticket with the railway company, and when it is returned to him, the time will be extended for a number of days, equal to the time that he has not used the ticket; but he must not ask this concession oftener than once in three months. Another law in the same state requires railways to refund cash fares paid by season ticket holders when they happen to make a journey without taking their ticket with them.

Referring to the application of the full crew law on "mixed trains," Attorney-General Honan, in an opinion to Chairman Wood of the Indiana railway commission, has laid down conditions under which prosecutions may be brought by the commission against railways accused of violations of the law. He holds that in cases where the evidence shows that a train is operated chiefly as a passenger, express or mail train the prosecution should be brought under the section of the full crew law applying to such trains, while if it shows that the train is operated chiefly as a freight train prosecutions should be based on that part of the law relating to freight train operation.

An effort is being made by the Chicago & Western Indiana to force the Chicago & Eastern Illinois to bring its passenger trains entering Chicago into the Dearborn street station over the tracks of the former road, instead of into the La Salle street station, as it has been doing since its acquisition by the Rock Island in 1904. The object is to make the C. & E. I., which is one of the five joint owners of the Western Indiana, assume a greater proportionate share of the expenses of maintenance and operation of the latter road, which expenses, according to contracts between the five roads, are shared on a wheelage basis. This is a revival of a suit brought by the other four roads—the Erie, Wabash, Grand Trunk and Monon—against the Eastern Illinois, which was dismissed by Judge Carpenter in 1907 for want of equity.

The strike at the shops of the Baldwin Locomotive Works, Philadelphia, which was begun by the boilermakers more than a week ago, has resulted in the stopping of work in all departments in a large part of the plant, but the company maintains a firm attitude, and, according to a recent statement, more than half of the employees are still at work. Of the 10,000 who struck, more than 2,000 returned to work within a few days. The machine shop at 16th and Spring Garden streets is working full force, but the strikers continue to make strenuous efforts to get these men out and have had some little success. Several hundred molders and coremakers left their work at the Eddystone shops on Wednesday of this week. Philadelphia papers say that the company will, if necessary, sub-let its pending contracts rather than submit to the strikers.

To find Texas taking an attitude less radical than that of New York would be a surprising discovery, but something of that kind is suggested in a news item from Austin, which says that the attorney-general of Texas has handed to the state railway commission an "interpretation" of the stock and bond law to the effect that a railway company has the right to issue and sell its stock without commission approval or regulation. The law simply requires the company to file with the commission a list of its stockholders. More surprising still, it is said that the mem-

bers of the commission have unanimously agreed to follow the new ruling, although Chairman Mayfield expressed himself as hesitating to depart from a policy so long adhered to by the commission—the policy of holding all issues of stock and bonds illegal unless approved beforehand by the commission.

The Latest Form of Train Accident: Cars Dented.

Progress toward perfection in railway operation has now reached that stage where, by a look into the future, one may discern the possibility of partly abolishing the term "accident"—the first four letters of the word, at least. Following is a recent press despatch from Navada City, Cal.:

"Constable Harvey of Truckee arrived here this morning with two prisoners. . . . Harvey and his prisoners were caught in a train wreck in the snow sheds the other side of Summit. A broken flange derailed a coach and the steel car in which they rode was thrown from the track and dented. Had it been a wooden car many people would have been injured and possibly killed. The snow sheds were torn badly."

British Accident Record.

The report of accidents on the railways of Great Britain and Ireland for the year ending December 31, 1910, shows 23 passengers, 9 employees and two other persons killed in train accidents; and 1,111 passengers, 113 employees and 7 other persons injured. Other accidents to trains and connected with the operation of trains, such as persons on the track being run over, bring the totals up to 1,062 persons killed, and 8,342 injured; as compared with 971 killed and 7,592 injured in the year preceding. The most notable difference between the two years is in the first item—that of passengers killed in train accidents; the record for 1909 showing only one, as compared with 23 in 1910. Accidents to persons where the movement of cars and engines was not concerned, when added to the figures given above, make the totals for the last year 121 passengers, 420 employees and 580 other persons killed and 4,080 passengers, 25,131 employees and 893 other persons injured.

Cost of Omnibus Operation in London.

The London General Omnibus Company now operates over 1,000 automobile omnibuses, which during the year 1910, earned a profit of £59,400; but the company still has a large number of horse-drawn omnibuses, on which a considerable loss is sustained. At the recent Good Roads Congress, held at Brussels, where these facts were brought out, a statement was presented showing the comparative cost of operation of "autobusses" and trolley cars; from which it appears that trolley cars cost 9.28 pence per car per mile, while autobusses cost 8.99 pence per mile; and the dividends paid by the trolley car line amounted to 2.01 pence per car per mile, while the dividends paid by the autobusses amounted to only about half a penny a mile. The statements in detail show that an allowance has been made for depreciation; and that rents, taxes and insurance have been properly charged. From this it would appear that the omnibus, in spite of its smaller carrying capacity, and apparently greater loss, due to friction and wear and tear, is the more economical mode of transportation; but there still remains a large difference unnoticed in the fact that the roadway used by the omnibuses is maintained entirely by direct taxation of the public. In the trolley-car accounts 0.43 pence per car mile is allowed for keeping up the roadway. How much ought to be allowed for maintenance of the roadway used by the buses does not appear.

New York City Subways.

The joint committee of the Board of Estimate (of the city), and the New York State Public Service Commission, this week made a report presenting its compromise plan for the extension of subways in Manhattan, Bronx, Brooklyn and Queens boroughs, New York; the work of the committee having been to harmonize, so far as possible, the conflicting plans presented to the Public Service Commission by the two rival operating companies—the Interborough Rapid Transit and the Brooklyn Rapid Transit companies. The committee report will be the subject of a public hearing by the Board of Estimate next week, Thursday. The committee proposes to allow the Interborough to build a part of the desired extensions and the Brooklyn Rapid Transit a part. In case these companies do not accept the scheme now offered, the committee recommends that the city proceed at once itself to build the "tri-borough route," laid out by the commission last year. The principal features of the present report are as follows: The Interborough to extend its present line northward from Forty-second street through Lexington avenue and southward from Forty-second street through Seventh avenue; also to build extensions in Brooklyn through the Eastern Parkway and Nostrand avenue; and in Queens to Corona and Astoria, by way of the Belmont tunnel; the Brooklyn Rapid Transit to extend its line through Manhattan avenue in Brooklyn and over the Manhattan bridge; from Brooklyn borough hall, by tunnel to Liberty street, Manhattan; and then northward, mainly through Broadway, to Fifty-ninth street; and east through Fifty-ninth street over Queensborough bridge. The plans proposed in the committee's report provide for 88 miles of new construction, the estimated cost of which is given as below.

Total cost of new system	$257,600,000
City's contribution	131,400,000
Interborough contribution	75,800,000
B. R. T.'s contribution	50,400,000
Total available credit of the city	300,000,000
Miles of new roads to each company	44

Estimated time to build subways and complete elevated improvements, two to four years.

Chinese Bonds Offered in New York.

The American syndicate which for months has been negotiating for the control of a Chinese government loan for the construction of railways, announces that subscriptions will now be taken for about $7,500,000, being a part of an issue (first series) of $30,000,000 to be offered in New York, London, Paris and Berlin. The loan is the "5 per cent. Hukuang railways sinking fund gold loan of 1911," and the American bankers are J. P. Morgan & Co.; Kuhn, Loeb & Co.; the First National Bank and the City National Bank.

Local Freight Agents.

The American Association of Local Freight Agents, formerly the Association of Local Freight Agents' Associations will hold its annual meeting at the Coates House, Kansas City, Mo., June 20 to 24. Among the subjects to be discussed are: How to Secure Friendly Co-operation of Shippers and the Public; Uniform Waybill and Freight Bill Forms On All Roads; Auditor's Revision of Billing in Local Offices at Large Terminal Points; Final Decision Regarding Correct Charges Should Be Made at Billing Station; Elimination of Waybills By Forwarding Freight on Shipper's Dray Tickets; Federal Livestock Regulations; and Why Continue Demurrage Associations?

The president of the association is C. A. Witzel (B. & O.), Cleveland, Ohio, and the secretary is R. O. Wells (Ill. Cent.), East St. Louis, Ill.

American Association of Demurrage Officers.

The 22nd annual convention of the American Association of Demurrage Officers will be held at the International Hotel, Niagara Falls, N. Y., June 22. One of the principal discussions at the meeting will be on the National Uniform Demurrage Rules, with a view to bringing out the experience of all the members. The president of the association is J. F. Roach, St. Louis, Mo., and the secretary is A. G. Thomason, 294 Washington street, Boston, Mass.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 24 Park Place, New York.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago.

AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.; annual convention, July 11-13, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 26, 1911, Boston, Mass.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The traffic department of the Pennsylvania announces that the missionary work done by the pamphlets which it has circulated among the farmers, has resulted in the establishment of a Farmers' Club at Price, Md.

The shipments of coal over the Carolina, Clinchfield & Ohio for the five months ending May 31, amounted to 43 per cent. more than for the corresponding period of 1910. New mines are being opened in the Virginia coal regions served by this road.

Several changes in its train schedules have been announced by the Chicago Great Western resulting in reductions in the time between Chicago and St. Paul. Between Fort Dodge, Iowa, and Oelwein, motor cars have been substituted for two steam trains.

An additional first-class train, to be known as the "Centennial State Special," will be put on by the Chicago & North Western on June 18 to run from Chicago to Denver, leaving Chicago daily at 10 a. m., and arriving in Denver at 1:15 p. m. of the next day. Plans are also being made for a new first-class train to leave Chicago at the same time for Portland and other points in the northwest.

Shippers at Kansas City and St. Joseph, Mo.; Omaha, Neb.; and Sioux City, Iowa, have protested to the Interstate Commerce Commission against the action of the Santa Fe and other roads in the Middle West in cancelling their "return shipment rates," which was done following a decision of the commission that return shipments of damaged or unaccepted goods, which it had been the habit of the roads to carry at 50 per cent. of the regular charge, must be made within ten days at most.

Beginning June 18 through trains will be run by the Chicago, Burlington & Quincy in connection with the Denver & Rio Grande and the Western Pacific between Chicago and San Francisco. The "Colorado Limited" of the Burlington, which leaves Chicago daily at 9:45 a. m. and arrives at Denver at 1 p. m. of the next day, will be used in this service, the time for arrival at Salt Lake City being 4:15 p. m. of the third, and at San Francisco 10 p. m. of the fourth day. Returning, the train will leave San Francisco at 6:30 p. m., reach Salt Lake City at 3:30 a. m. of the third day, Denver at 9:05 a. m. of the fourth day, and arrive in Chicago at 2 p. m. of the fifth day.

General Review of Crop Conditions.

The United States Department of Agriculture bulletin says: "The month of May was not, on the whole, very favorable for crop growth, drouthy conditions having prevailed over a great portion of the United States. In consequence the average condition of crop growth in the United States on June 1 was 2.8 per cent. below the average condition on that date. Some relief from the favorable conditions came at the close of May and first part of June. A comparison of the conditions of various crops on June 1, with their average growing condition on June 1 of recent years (past ten years for most crops) is shown as follows (100 representing average conditions and not normal):

"Cotton 108.5, sugar beets 103.2, apples 102.5, raspberries 101.8, spring wheat 101.1, watermelons 100.6, pears 99.7, cantaloupes 99.6, blackberries 99.5, sugar cane 99.5, barley 99.2, winter wheat 98.5, rye 98.2, oats 96.9, alfalfa 96.1, onions 95.5, lima beans 92.5, cabbage 91.0, pastures 90.2, hemp 89.0, clover hay 84.6, all hay 85.1, peaches 83.5.

"The above figures relate only to relative growing conditions, not taking into account changes in acreages. Taking into account both acreage and condition, indications are for about 9.9 per cent. larger wheat crop than was produced last year, and 10.2 per cent. larger than the average of the past five years; oats crop 13.3 per cent. less than last year but 4.8 per cent. more than the average of the past five years; barley 8 per cent. more than last year, and 5.3 per cent. more than the five-year average. Total areas have not been estimated for the other crops, except that the rye area planted is about 1.2 per cent. less than last year. Clover (for hay) acreage 6.3 per cent. less and sugar cane acreage 0.4 per cent. more than last year. The average condition of all crops,

by states, on June 1, was approximately as follows, 100 indicating the average (not normal) for recent years on June 1:

"Maine 93.7, New Hampshire 84.2, Vermont 89.0, Massachusetts 82.3, Rhode Island 86.2, Connecticut 79.0, New York 83.9, New Jersey 81.6, Pennsylvania 88.1. Average for above division 86.2; conditions compared with June 1, 1910, 87.0 per cent.

"Delaware 81.1, Maryland 84.7, Virginia 85.3, West Virginia 80.2, North Carolina 97.2, South Carolina 98.0, Georgia 109.1, Florida 108.8. Average for above division 98.7 per cent.; condition compared with June 1, 1910, 98.0 per cent.

"Ohio 97.5, Indiana 96.3, Illinois 92.6, Michigan 95.7, Wisconsin 98.8. Average for division 93.6 per cent.; compared with June 1, 1910, 96.7 per cent.

"Minnesota 102.6, Iowa 101.2, Missouri 86.6, North Dakota 100.6, South Dakota 96.5, Nebraska 98.7, Kansas 85.3. Average for division 95.9 per cent.; compared with June 1, 1910, 102.0 per cent.

"Kentucky 93.4, Tennessee 95.1, Alabama 111.3, Mississippi 106.2, Louisiana 110.8, Texas 107.7, Oklahoma 85.4, Arkansas 104.6. Average for division 102.2 per cent.; compared with June 1, 1910, 100.2 per cent.

"Montana 100.3, Wyoming 97.7, Colorado 88.4, New Mexico 111.4, Arizona 107.1, Utah 95.8, Nevada 93.3, Idaho 102.3, Washington 103.1, Oregon 103.2, California 96.3. Average for division 99.1 per cent.; compared with June 1, 1910, 96.1 per cent."

Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 98, covering car balance and performance for February, 1911, says:

"The general performance was strikingly similar to that for January, such changes as there were in the various averages being slight. The miles per car per day averaged 22.6, including surplus cars. The average for active cars is 24.6. Ton miles per car per day, while practically the same as January in the average for all cars, shows an increase in the active car average from 352 in January to 359 in February.

"The homeward movement still continues, the proportion of Home cars on line increasing from 58 per cent. in January to 61 per cent. in February. The loaded mileage, however, shows an increase from 67.2 per cent. to 67.8 per cent., indicating that the return movement had practically spent its force.

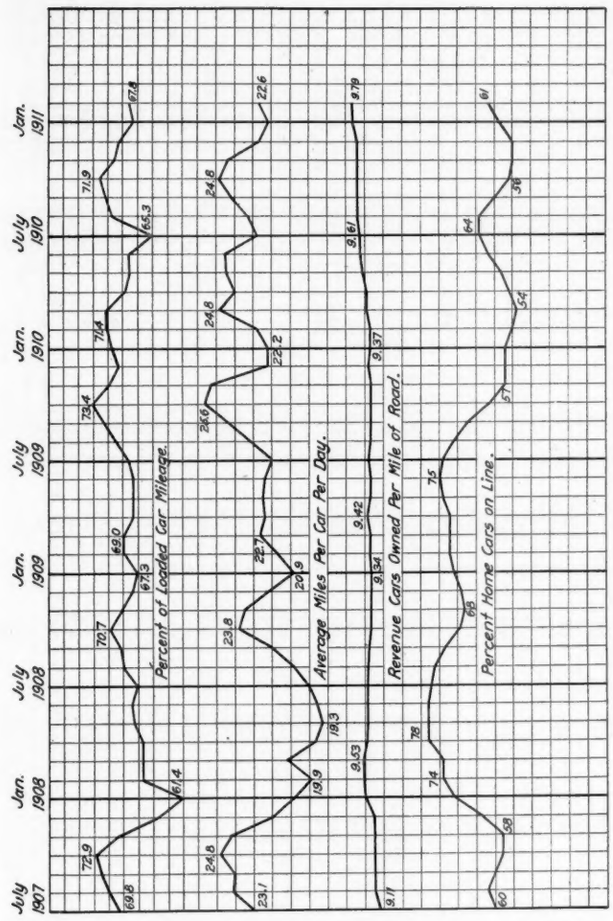
"While comment has been made in previous bulletins on the decrease in the proportion of loaded mileage that invariably follows a recession in traffic, very little has been done to analyze this decrease. One reason for this is that the details of loaded and empty mileage as between home, foreign and private cars are not reported by all roads. We have, however, drawn off such figures as are available in order to secure a comparison between October, 1910, and February, 1911, and the results are shown in the accompanying small table.

	Feb., 1911.	Oct., 1910.	Increase, Per Cent.	Decrease, Per Cent.
Home Cars on Line	641,520	603,082	6.37	.....
Foreign Cars on Line	418,068	478,445	.....	12.62
Private Cars on Line	32,347	30,450	6.22	.....
	1,091,935	1,111,977	.....	1.81
Ratio Home Cars to Total R. R. Cars	.61	.56	8.93	.....
Average Miles per Car per Day:				
Home Cars	17.4	20.5	.....	15.12
Foreign Cars	28.1	28.3	.....	.71
Private Cars	52.5	57.0	.....	7.89
All Cars	22.5	24.8	.....	9.27
Percent. of Loaded Mileage:				
Home Cars	66.5	71.9	.....	7.51
Foreign Cars	71.1	78.0	.....	8.85
Private Cars	66.1	67.3	.....	1.78
	68.7	74.6	.....	7.91

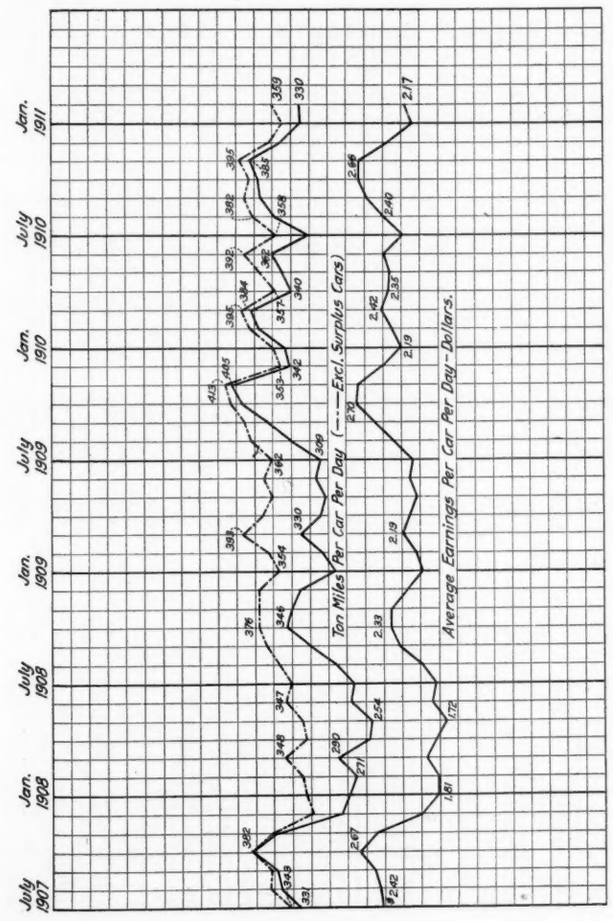
"It will be noted that while the average miles per car per day for all cars shows some decrease, the average for foreign cars was practically unchanged, the decrease being entirely in home and private cars, which is a natural result of the lessened traffic, and the increase in surplus equipment. The fact that there was practically no decrease in the daily movement of foreign cars indicates that these cars were being moved instead of stored, and as shown by the loaded mileage percentage, a con-

CAR BALANCE AND PERFORMANCE IN FEBRUARY, 1911.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	76,407	720,943	221,799	182,233	172,971	389,975	18,317	137,810	28,605	142,588	106,182	2,197,830
Average number of system cars on line	42,568	438,178	138,040	106,524	95,204	268,256	6,843	85,305	21,523	65,306	73,414	1,341,161
Railway-owned cars: Average foreign on line	35,960	253,899	94,905	78,702	66,326	116,810	11,467	56,616	21,085	52,902	34,044	822,716
Total Railway-owned cars on line	78,528	692,077	232,945	185,226	161,530	385,066	18,310	141,921	42,608	118,208	107,458	2,163,877
Excess	2,121	.....	11,146	2,993	.....	.....	1,426	4,111	14,003	.....	1,276	.....
Per cent. of cars on line to total owned:												
Home	56	61	62	59	55	69	37	62	75	46	69	61
Foreign	47	35	43	43	38	30	63	41	74	38	32	37
All railways	103	96	105	102	93	99	100	103	149	84	102	98
Private cars on line	2,967	43,015	11,743	4,354	6,327	13,879	1,292	6,623	3,127	12,047	3,046	108,420
Total, all cars on line	81,495	735,092	244,688	189,580	167,857	398,945	19,602	148,544	45,735	130,255	110,504	2,272,297
Per cent. of cars in shop	4.72	5.34	5.86	5.90	6.88	6.77	5.57	6.92	4.66	5.71	6.23	5.90
No. of freight engines owned	1,110	10,631	2,921	3,070	2,600	6,326	495	2,763	748	2,637	2,151	35,452
Average cars on line per freight engine owned	73	69	84	63	64	63	40	54	61	49	51	64
Total freight-car mileage	37,770,877	465,587,145	136,138,701	117,415,990	113,047,511	247,426,824	19,307,907	84,121,244	32,163,894	105,198,493	76,031,931	1,434,210,517
Average miles per car per day	15.6	22.6	19.9	22.1	24.1	22.2	35.2	21.2	25.1	28.8	24.6	22.6
Per cent. loaded mileage	72.5	64.4	64.7	66.5	71.5	70.0	74.6	67.2	62.6	70.7	77.9	67.8
Ton-miles of freight, including company freight	420,280,615	7,166,877,885	1,781,178,583	1,772,909,706	1,238,472,148	1,949,367,475	301,710,050	1,117,659,901	353,561,397	1,501,056,593	1,087,682,326	18,690,156,679
Average ton-miles, including company freight:												
Per car-mile	11.1	15.4	13.7	15.1	14.8	13.2	16.3	13.3	11.0	14.4	14.3	14.4
Per loaded car-mile	15.4	23.9	21.2	22.7	20.5	19.4	21.8	20.0	17.5	20.4	18.3	21.4
Per car per day	184	348	279	334	361	311	601	282	276	415	351	330
Gross freight earnings	$4,714,015	$41,213,559	$10,498,218	$11,235,897	$11,132,008	$23,654,882	$2,222,726	$9,695,523	$3,011,526	$13,208,515	$7,146,810	$137,733,681
Average daily earnings: Per car owned	$2.20	$2.04	$1.69	$2.20	$2.30	$2.17	$4.45	$2.51	$3.76	$3.31	$2.42	$2.24
Per railroad car on line	2.14	2.13	1.61	2.17	2.46	2.19	4.47	2.44	2.55	4.00	2.40	2.28
All cars on line	2.07	2.00	1.53	2.12	2.38	2.11	4.17	2.33	2.35	3.63	2.33	2.17



Car Performance in 1907 to 1911 Inclusive.



Car Earnings and Mileage in 1907 to 1911 Inclusive.

siderable portion of this movement was not productive of revenue. Analyzing the loaded mileage percentages we note that in October, which may be taken as fairly representative month, foreign cars made a much higher proportion of loaded mileage than home cars, the comparison being 78.0 per cent. of foreign against 71.9 of home. This is quite logical, as interchange traffic as a rule is largely handled in cars that are suitable for general service, while cars handling commodities that tend to lower loaded percentage, remain as a rule on their home lines. In February, however, while both home and foreign cars show a decrease in loaded percentage, the foreign percentage is less than the October loaded percentage for home cars. While a portion of this decrease is probably attributable to an empty movement which would eventually be necessary in any event, it seems incredible that such a large decrease as this should be necessary, and as the private car loaded mileage is practically unchanged, the natural inference is that a large portion of the empty mileage which caused this change in the loaded percentage, is excess mileage brought about by the return of cars to their owners in order to save per diem.

"It will be noted that while the home cars or line increased about 40,000, or 60 per cent., the decrease in foreign cars amounted to 60,000. These figures if taken for all roads in the country should of course equal each other, but when taken for a portion of the roads there is room for a considerable discrepancy. In the present instance this difference is due to the fact that several of the larger roads omitted from this tabulation did not reduce the equipment on line to such an extent as did roads selected for this comparison."

The accompanying large table shows car balance and performance for February, and the charts show car performance and earnings in 1907 to 1911 inclusive.

INTERSTATE COMMERCE COMMISSION.

The Commission on June 12, dismissed the proceedings in its suspension of advances in rates on agricultural implements and other articles in South Western Freight Association territory, the railways having filed new tariffs, providing for the continnuance of the old rates.

The commission on June 9 issued a number of orders, permitting the continuance of fares which do not conform to the long and short haul rule. The Baltimore & Ohio Southwestern is permitted to charge higher rates out of Cincinnati, Ohio, to points in Illinois and Missouri than the combinations of the locals until May 1, 1912, owing to the state 2-cent fares in Ohio, Indiana and Illinois. The same permission is granted the Mobile & Ohio between various points on its line. The Missouri Pacific and the St. Louis, Iron Mountain & Southern are permitted to continue the present charges for passenger fares and excess baggage rates, owing to the state laws of Nebraska. The Coast line of the Atchison, Topeka & Santa Fe is permitted to continue the present charges on excess baggage. The International & Great Northern is permitted to continue charging the higher rates to intermediate points in Texas because of a circuitous route. Likewise the Live Oak, Perry & Gulf is permitted the higher fares to intermediate points on account of the circuitous route. The Oregon-Washington Railroad & Navigation Company was ordered to discontinue on September 1, 1911, the charging of higher fares in disregard of the long and short haul clause, which have been maintained in order to have the fares multiples of five. The same is denied the Missouri Pacific and the Yazoo & Mississippi Valley railways.

Complaint Dismissed.

Decarie Incinerator Co. v. Minneapolis & St. Louis et al. Opinion by the commission:

Rate of $1.65 for transportation of a carload of parts of a garbage incinerator from Hopkins, Minn., to Sacramento, Cal., not found unreasonable. (21 I. C. C. 71.)

Florida Mercantile Agency v. Pennsylvania Railroad et al. Opinion by the commission:

Commodity rate of 60½ cents per 100 lbs. on fresh meat and dressed poultry in carloads from Jersey City, N. J., to Jacksonville, Fla., not found to be unreasonable. (21 I. C. C. 85.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF APRIL, 1911. (SEE ALSO ISSUE JUNE 9.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$234,038	$81,031	$349,040	$51,489	$93,110	$9,942	$116,654	$11,389	$282,576	$66,464	—$337	$13,241	$52,886	—$62,987
Atlanta, Birmingham & Atlantic	662	141,270	45,272	200,018	29,894	37,259	15,239	88,221	9,267	179,880	20,138	.....	10,500	9,638	—17,130
Baltimore & Ohio—System	4,439[1]	5,339,870	1,132,065	6,888,218	650,076	1,045,777	151,438	2,506,007	143,779	4,497,077	2,391,141	—38,311	225,894	2,126,936	334,666
Bangor & Aroostook	627[2]	205,279	45,551	264,224	41,887	33,986	2,266	76,080	9,125	163,345	100,879	.....	2,525	98,354	—15,210
Bessemer & Lake Erie	205	418,751	22,434	446,704	59,898	123,556	6,531	142,996	8,002	340,983	105,721	.....	6,000	99,721	—140,369
Buffalo, Rochester & Pittsburgh	572	586,109	80,092	685,448	144,342	143,825	9,665	234,103	12,396	544,331	141,117	—649	16,000	124,468	108,343
Central New England	277	246,224	25,875	286,259	41,004	22,393	1,523	86,948	6,367	158,235	128,024	118	19,000	109,142	—992
Central of Georgia	1,915	555,362	260,580	897,784	143,547	175,043	32,997	346,045	43,173	740,805	156,979	6,328	45,470	117,837	9,396
Central Vermont	411	226,384	69,651	321,172	28,224	71,588	7,042	143,092	8,883	258,829	62,343	371	12,750	49,964	—7,370
Chicago & Eastern Illinois	966	710,213	155,976	923,263	91,608	126,019	24,191	353,154	32,707	627,679	295,584	558	28,500	267,642	156,158
Chicago & Erie	269	311,000	55,243	425,346	35,535	87,718	17,317	202,869	10,451	353,890	71,456	.....	11,388	60,068	9,924
Chicago Great Western	1,495	670,703	214,360	962,521	147,214	130,836	46,980	387,773	29,973	742,776	219,745	127	33,940	185,932	—18,600
Chicago, Indiana & Southern	329	292,834	19,874	320,252	46,242	64,483	8,168	115,563	8,927	243,383	76,869	944	13,900	63,913	13,470
Chicago, Indianapolis & Louisville	617	336,237	130,032	517,097	63,706	68,471	16,300	178,396	13,867	340,740	176,357	.....	22,500	153,857	—3,643
Chicago, Rock Island & Gulf	471[3]	179,926	51,555	246,028	32,022	17,969	8,665	92,432	8,576	159,664	86,364	—64	9,502	76,798	62,765
Cincinnati, Hamilton & Dayton	1,014[4]	549,620	116,626	750,603	80,541	144,459	17,501	345,962	18,850	607,313	143,290	.....	32,303	110,987	70,858
Cincinnati, New Orleans & Texas Pacific	337	564,524	114,553	724,703	93,751	176,185	18,403	243,586	18,972	550,897	173,806	—1,378	21,800	150,628	—131,513
Cleveland, Akron & Columbus	212	149,042	41,585	201,987	39,075	35,273	2,297	67,045	3,730	147,420	54,567	.....	8,500	46,067	556
Colorado & Southern	1,173[5]	442,108	119,107	600,930	65,669	130,039	10,712	196,135	20,874	423,429	177,501	—2,455	24,700	150,346	7,848
Cumberland Valley	162	178,070	48,736	236,165	56,579	29,676	4,784	75,602	6,127	172,768	63,397	130	5,141	58,386	—39,696
Delaware & Hudson Co.—R. R. Dept.	819[6]	1,501,693	203,332	1,754,927	134,530	262,617	23,449	610,500	46,907	1,078,003	676,924	—992	43,866	632,066	—132,432
Duluth & Iron Range	191[7]	233,594	23,502	269,348	75,230	46,103	785	76,776	12,979	211,873	57,475	—7,443	10,723	39,309	—124,717
Duluth, Missabé & Northern	316[8]	191,270	40,835	237,476	84,876	71,782	1,686	85,722	13,031	257,097	—19,621	—1,242	9,600	—30,463	—249,560
Duluth, South Shore & Atlantic	612	154,608	69,433	236,707	45,464	27,380	7,540	92,421	6,466	179,271	57,436	371	18,000	39,807	—29,022
El Paso & Southwestern Co	901	448,000	80,387	558,432	67,552	76,005	10,316	160,948	19,968	334,789	223,643	—606	20,076	202,961	—67,076
Elgin, Joliet & Eastern	831[9]	612,417	10	647,441	56,220	109,109	4,124	213,426	12,652	395,531	251,910	.....	19,600	232,310	—1,847
Florida East Coast	583	323,262	153,978	575,489	36,920	51,096	4,921	145,382	8,824	247,143	328,346	—2,090	15,500	310,755	—2,462
Fort Worth & Denver City	454	200,492	140,610	364,855	27,889	61,217	5,646	109,641	14,607	219,000	145,855	—368	10,522	134,965	10,242
Galveston, Harrisburg & San Antonio	1,338	546,599	261,681	854,766	121,061	118,830	29,578	336,887	26,981	633,337	221,429	—3,232	29,697	188,500	47,820
Georgia	307	158,300	65,885	242,260	24,563	35,627	10,286	116,785	7,022	194,283	47,977	.....	2,100	45,877	—6,241
Grand Rapids & Indiana	587	251,561	109,037	389,916	53,819	67,776	11,718	182,303	14,953	330,569	59,347	—1,017	23,351	34,979	—11,918
Hocking Valley	350	383,310	62,484	480,577	49,995	69,395	8,588	170,384	20,138	318,500	162,077	.....	24,950	137,127	56,481
Houston & Texas Central	789	283,232	122,050	437,428	58,630	53,617	17,484	219,288	22,119	371,138	66,290	—1,622	17,816	46,852	29,790
Illinois Central	4,574[10]	3,106,570	959,694	4,648,972	617,676	977,229	100,778	1,774,939	109,557	3,580,179	1,068,793	—9,213	241,524	818,056	29,930
Iowa Central	559	224,003	38,103	275,123	40,308	41,802	6,786	114,780	8,628	212,304	62,819	.....	9,659	53,160	22,780
Kanawha & Michigan	175	180,166	27,260	213,921	23,343	47,014	1,990	62,521	7,893	142,761	71,160	3	6,984	64,179	47,069
Kansas City Southern	827	511,258	128,834	730,220	65,491	104,099	26,144	261,536	37,881	495,151	235,069	.....	34,612	200,457	—65,985
Lake Erie & Western	886	306,907	61,264	392,470	70,985	84,342	11,673	177,304	11,936	356,240	36,230	.....	18,500	17,730	—35,820
Long Island	395	301,272	467,457	809,629	114,600	99,994	11,309	373,375	20,349	618,627	191,002	33,799	53,333	171,468	—12,570
Maine Central	932	459,449	193,945	700,535	87,883	113,366	7,231	270,724	22,400	501,604	198,931	1,398	41,311	159,018	—17,729
Minneapolis & St. Louis	1,027	242,738	82,264	352,623	40,311	58,929	10,452	157,018	12,978	279,688	72,935	—114	18,648	54,173	—18,005
Minneapolis, St. Paul & S. S. Marie	3,764[11]	1,119,812	379,181	1,622,691	209,284	266,855	42,186	671,626	42,271	1,232,222	390,469	344	104,441	286,372	—312,114
Missouri, Kansas & Texas	1,737[12]	830,708	342,438	1,300,259	176,095	200,157	38,577	453,073	42,000	909,902	390,357	1,477	58,500	333,334	—
Missouri, Kansas & Texas of Texas	1,348	371,953	268,177	704,083	119,030	93,015	26,173	446,574	31,504	716,296	—12,213	—2,720	22,852	—37,785	—53,764
Mobile & Ohio	1,114	670,148	105,841	917,962	104,430	152,496	29,531	349,590	34,553	670,600	247,362	—854	25,460	221,048	—30,318
Morgan's La. & Tex. R. R. & S. S. Co.	404[13]	236,040	107,017	365,147	54,428	54,605	12,784	128,280	13,741	263,838	101,309	—1,549	18,756	81,004	28,771
Nashville, Chattanooga & St. Louis	1,230	745,773	211,025	1,026,780	162,703	171,744	35,752	377,500	24,969	772,668	254,112	—926	25,278	227,908	13,493
New Orleans & North Eastern	196	203,957	46,186	274,128	25,745	36,731	8,817	106,346	11,656	189,295	84,833	181	9,250	75,764	—25,426
New York, Chicago & St. Louis	562	724,416	148,744	907,675	102,035	107,901	50,848	393,655	18,392	672,831	234,844	—2,367	29,600	202,877	—77,385
New York, Ontario & Western	546	577,140	93,723	697,780	78,116	117,920	10,822	294,967	15,439	517,264	180,516	—5,895	17,500	157,121	—82,814
New York, Philadelphia & Norfolk	112	213,108	35,138	267,929	36,181	50,309	3,926	107,733	11,822	209,971	57,958	.....	7,500	50,458	—39,540
New York, Susquehanna & Western	152	188,932	47,709	264,007	16,756	21,314	1,477	90,062	3,960	133,569	130,438	4,601	11,771	123,268	50,543
Norfolk Southern	608	192,686	55,796	261,831	24,303	28,905	4,899	83,654	12,829	154,590	107,241	—102	5,900	101,239	—
Northern Central	469	871,334	172,453	1,102,356	143,350	182,902	14,976	498,477	22,529	862,234	240,132	255	36,740	203,637	—33,834
Peoria & Eastern	351	157,007	49,991	226,662	44,346	46,108	7,264	111,204	5,831	214,753	11,909	.....	9,500	2,409	—54,201
Philadelphia & Reading	1,022	3,135,475	561,904	3,857,997	392,137	681,331	38,597	1,172,513	95,424	2,380,002	1,477,995	76,205	84,075	1,470,125	—285,373
Philadelphia, Baltimore & Washington	713	756,844	631,017	1,552,413	198,493	214,955	35,157	677,112	33,087	1,148,804	403,609	.....	47,395	356,214	60,696
Pittsburg & Lake Erie	215[14]	979,306	117,519	1,130,946	136,987	146,247	16,986	285,409	22,288	607,917	523,029	—415	30,000	492,614	45,933
Rutland	468	153,265	90,456	273,957	28,406	45,098	7,689	106,991	5,795	193,979	79,978	.....	9,806	70,172	2,302
St. Louis & San Francisco	4,732	1,902,861	825,082	2,969,588	258,457	432,042	77,945	1,174,572	102,354	2,045,370	924,218	.....	153,814	770,414	—25,991
St. Louis, Brownsville & Mexico	501	108,806	46,899	167,689	26,624	10,925	2,971	60,877	8,694	110,091	57,598	.....	4,500	53,098	19,153
St. Louis Southwestern	797[15]	402,653	95,302	525,365	57,931	104,622	24,689	144,798	22,706	354,746	170,619	—323	27,429	142,867	—5,305
St. Louis Southwestern of Texas	703	169,310	68,083	257,219	68,615	79,329	10,996	128,785	16,528	304,253	—47,034	—226	10,000	—57,260	8,345
San Antonio & Aransas Pass	727	183,460	76,768	277,488	72,610	52,125	5,295	148,502	10,680	289,212	—11,724	.....	14,500	—26,224	—50,540
San Pedro, Los Angeles & Salt Lake	1,105[16]	492,945	232,990	773,344	141,183	140,156	33,990	289,915	17,442	622,686	150,659	—5,673	28,619	116,366	236,255
Seaboard Air Line	3,046[17]	1,259,264	407,579	1,881,488	216,415	258,483	59,127	666,076	56,435	1,256,536	624,952	452	72,000	553,404	—21,892
Spokane, Portland & Seattle	551[18]	294,438	145,596	461,157	56,958	31,853	8,790	105,627	10,149	213,377	247,780	832	42,200	206,413	41,796
Texas & New Orleans	458	194,846	85,026	296,362	62,938	61,915	7,508	130,820	9,281	272,462	23,900	165	12,257	11,808	—33,576
Toledo & Ohio Central	444	280,734	40,621	334,907	65,050	56,677	7,949	127,535	9,856	267,067	67,840	—141	20,344	47,355	106,056
Toledo, St. Louis & Western	451	244,199	30,432	293,477	25,988	41,240	9,487	110,051	8,690	195,456	98,021	.....	14,550	83,471	—7,270
Vandalia	827	504,959	181,851	778,477	126,743	137,181	24,214	323,418	20,326	631,882	146,595	.....	27,401	119,194	122,223
Virginian	474[19]	278,490	18,692	307,652	37,628	54,208	4,964	75,831	7,939	180,570	127,082	4,265	17,600	113,747	47,940
Wabash	2,515	1,566,225	548,180	2,294,262	333,857	406,868	75,297	1,003,793	67,806	1,887,621	406,641	—2,364	79,892	324,385	43,956
West Jersey & Seashore	353	155,022	298,187	479,944	66,366	45,282	11,281	190,716	9,832	323,477	156,467	—1,556	23,228	131,683	103,677
Wheeling & Lake Erie	457	453,318	42,606	533,697	62,912	116,299	6,872	188,345	13,978	388,406	145,291	1,108	20,337	126,062	22,155

REVENUES AND EXPENSES OF RAILWAYS.

TEN MONTHS OF FISCAL YEAR, 1911.

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
Alabama Great Southern	309	$2,516,045	$933,859	$3,774,937	$484,121	$881,924	$102,981	$1,166,012	$94,037	$2,729,075	$1,045,862	—$6,543	$135,558	$903,761	—$68,367
Atlanta, Birmingham & Atlantic	662	1,729,051	507,545	2,381,836	294,057	371,382	150,543	878,619	91,912	1,786,513	595,323	.....	110,145	485,178	75.561
Baltimore & Ohio—System	4,439[1]	56,019,916	12,719,321	73,165,258	8,331,782	13,337,138	1,642,692	27,755,916	1,528,337	52,595,865	20,569,393	—123,023	2,190,576	18,255,794	—2,068,292
Bangor & Aroostook	627[2]	1,964,720	529,902	2,638,947	433,969	315,548	32,876	816,817	107,260	1,706,470	932,477	.....	23,199	909,278	—122,549
Bessemer & Lake Erie	205	5,522,827	298,467	5,910,362	708,667	1,347,237	76,173	1,715,480	112,565	3,960,122	1,950,240	.....	86,209	1,864,031	—869,416
Buffalo, Rochester & Pittsburgh	572	6,504,518	891,002	7,666,032	814,576	1,445,806	111,165	2,479,989	131,830	4,983,366	2,682,666	—237	180,000	2,502,429	43,077
Central New England	277	2,195,065	292,379	2,629,111	483,183	224,242	18,164	771,850	50,159	1,547,598	1,081,513	119	130,000	951,632	—54,866
Central of Georgia	1,915	7,252,454	2,915,061	11,118,982	1,484,414	1,835,725	326,021	3,569,504	407,588	7,623,252	3,495,730	64,681	457,428	3,102,983	145,453
Central Vermont	411	2,158,477	870,870	3,271,978	378,983	499,574	70,704	1,518,508	80,936	2,548,705	723,273	5,262	111,867	616,668	—36,456
Chicago & Eastern Illinois	966	8,052,680	1,770,914	10,461,984	993,963	1,768,055	236,624	3,859,833	331,386	7,189,862	3,272,122	—10,991	281,129	2,980,002	84,661
Chicago & Erie	269	3,344,921	658,209	4,408,471	470,579	909,640	200,270	2,011,651	97,316	3,689,456	719,015	.....	113,425	605,590	—166,624
Chicago Great Western	1,495	7,360,002	2,370,918	10,525,489	1,178,531	1,572,426	465,264	4,268,161	350,355	7,834,737	2,690,752	1,849	332,696	2,359,905	—
Chicago, Indiana & Southern	329	2,758,666	236,517	3,078,241	423,542	614,796	86,609	1,195,064	89,387	2,409,393	668,843	—1,078	136,293	531,472	—289,774
Chicago, Indianapolis & Louisville	617	3,351,692	1,309,476	5,114,869	658,380	723,895	167,077	1,826,704	148,361	3,524,417	1,590,452	.....	225,000	1,365,452	—135,909
Chicago, Rock Island & Gulf	471[3]	1,747,101	590,804	2,495,432	365,382	186,905	90,052	906,182	81,990	1,630,511	864,921	—2,530	67,678	794,713	73,210
Cincinnati, Hamilton & Dayton	1,014[4]	5,715,694	1,391,340	7,923,497	662,308	1,422,097	235,660	3,654,908	213,879	6,188,852	1,734,645	.....	308,048	1,426,597	—69,266
Cincinnati, New Orleans & Texas Pacific	337	5,848,396	1,408,818	7,653,190	817,897	1,553,544	203,485	2,260,644	180,295	5,021,865	2,631,325	—16,110	217,016	2,398,199	—257,148
Cleveland, Akron & Columbus	212	1,597,867	481,284	2,223,429	397,306	374,393	29,741	744,056	38,899	1,584,395	639,034	.....	88,000	551,034	70,419
Colorado & Southern	1,173[5]	6,015,859	1,317,952	7,767,534	879,990	1,521,831	118,389	2,464,217	222,337	5,206,764	2,560,770	—14,418	247,000	2,299,352	—232,625
Cumberland Valley	162	1,896,992	535,619	2,547,300	374,671	336,650	46,809	816,270	66,846	1,641,246	906,054	2,723	55,448	853,329	—109,060
Delaware & Hudson Co.—R. R. Dept	819[6]	14,393,695	2,469,426	17,384,388	1,312,191	2,471,368	221,395	6,125,300	415,782	10,546,036	6,838,352	—1,003	455,572	6,381,777	—359,737
Duluth & Iron Range	191[7]	5,445,609	261,043	5,805,519	654,790	548,983	5,169	1,326,641	128,497	2,664,080	3,141,439	—4,311	280,792	2,856,336	—1,267,837
Duluth, Missabe & Northern	316[8]	7,646,231	399,145	8,107,833	968,498	912,961	17,067	1,367,679	143,245	3,409,450	4,698,383	44,501	404,347	4,338,537	—1,809,616
Duluth, South Shore & Atlantic	612	1,657,711	795,003	2,590,504	383,821	294,940	98,014	1,004,580	69,351	1,850,706	739,798	6,678	177,871	568,605	—109,201
El Paso & Southwestern Co	901	4,907,782	810,020	6,016,673	754,100	806,455	106,934	1,726,921	225,133	3,619,543	2,397,130	11,041	189,403	2,196,686	—32,891
Elgin, Joliet & Eastern	831[9]	6,283,821	79	6,657,677	810,027	1,318,372	40,679	2,168,334	164,302	4,501,714	2,155,963	.....	165,400	1,990,563	—772,350
Florida East Coast	583	1,822,540	1,281,304	3,567,519	424,045	462,526	66,527	1,117,391	78,909	2,149,398	1,418,121	—2,090	142,641	1,273,390	265,779
Fort Worth & Denver City	454	2,818,519	1,425,452	4,459,568	426,849	725,686	59,430	1,402,234	147,144	2,761,343	1,698,225	—12,229	102,087	1,583,909	—175,803
Galveston, Harrisburg & San Antonio	1,338	6,395,638	2,385,403	9,251,904	1,212,134	1,406,132	282,298	3,406,378	284,869	6,591,811	2,660,093	—25,522	300,212	2,334,359	112,816
Georgia	307	1,847,895	745,298	2,761,845	340,558	410,974	104,735	1,123,050	72,148	2,051,465	710,380	.....	20,513	689,867	6,451
Grand Rapids & Indiana	587	2,607,039	1,418,306	4,336,296	559,739	723,393	121,285	1,921,525	147,377	3,473,319	862,977	—1,418	239,534	622,025	—252,773
Hocking Valley	350	4,919,958	733,092	6,021,715	762,023	965,721	88,570	1,976,541	174,971	3,967,826	2,053,889	.....	277,940	1,775,949	—411,451
Houston & Texas Central	789	3,706,030	1,394,803	5,454,204	763,311	656,516	182,667	2,221,162	216,692	4,040,348	1,413,856	—6,518	182,951	1,224,387	26,219
Illinois Central	4,574[10]	34,142,298	10,883,560	51,168,558	6,191,729	10,289,519	1,109,765	17,806,479	1,107,396	36,504,888	14,663,670	—41,761	2,209,994	12,411,915	1,944,680
Iowa Central	559	2,378,029	464,174	2,971,970	350,832	491,676	70,774	1,235,152	86,443	2,234,877	737,093	.....	97,698	639,395	46,466
Kanawha & Michigan	175	2,213,757	296,490	2,566,912	265,790	461,409	22,540	716,945	70,346	1,537,030	1,029,882	—64	75,900	953,918	360,002
Kansas City Southern	827	6,177,554	1,386,975	8,444,915	844,095	1,110,830	264,659	2,857,427	318,776	5,395,787	3,049,128	.....	292,652	2,756,476	300,592
Lake Erie & Western	886	3,618,841	753,761	4,624,289	755,279	880,186	150,705	1,821,394	123,556	3,731,119	893,170	.....	186,262	706,908	—426,506
Long Island	395	2,582,042	5,194,100	8,172,872	975,913	1,151,594	163,056	3,964,780	228,384	6,483,727	1,689,145	553,078	474,754	1,767,469	—538,820
Maine Central	932	4,549,232	2,450,160	7,470,294	1,141,724	1,120,460	73,051	2,883,142	258,249	5,476,626	1,993,668	13,469	374,789	1,632,348	—536,181
Minneapolis & St. Louis	1,027	3,034,215	1,023,126	4,341,933	448,812	564,929	110,215	1,740,172	148,755	3,012,883	1,329,050	—422	194,565	1,134,063	16,126
Minneapolis, St. Paul & S. S. Marie	3,764[11]	12,771,691	4,098,765	18,065,599	1,890,291	2,613,609	435,232	6,862,988	413,912	12,216,032	5,849,567	87,200	1,008,605	4,928,162	—2,784,075
Missouri, Kansas & Texas	1,737[12]	9,659,985	4,045,711	14,663,914	1,894,283	2,101,242	376,681	4,935,317	437,215	9,744,738	4,919,176	1,929	580,583	4,340,522	—
Missouri, Kansas & Texas of Texas	1,348	5,542,816	3,170,470	9,289,286	1,404,249	698,558	232,402	4,474,898	346,439	7,156,546	2,132,740	—8,655	224,954	1,899,131	380,074
Mobile & Ohio	1,114	6,755,758	1,202,140	9,277,454	1,076,312	1,603,160	323,837	3,226,436	345,466	6,575,211	2,702,243	—13,418	251,000	2,437,825	38,080
Morgan's La. & Tex. R. R. & S. S. Co	404[13]	3,009,186	1,023,220	4,287,731	583,529	516,836	114,422	1,489,097	136,781	2,840,665	1,447,066	—14,279	194,357	1,238,530	—2,862
Nashville, Chattanooga & St. Louis	1,230	7,284,977	2,376,976	10,314,117	1,566,391	1,903,486	353,636	3,659,235	246,897	7,729,645	2,584,472	—10,411	231,845	2,342,216	—92,344
New Orleans & North Eastern	196	2,257,681	521,396	2,983,448	296,089	445,293	92,039	1,068,231	115,442	2,017,094	966,354	—1,285	88,387	876,682	—45,457
New York, Chicago, & St. Louis	562	7,703,227	1,303,790	9,349,122	1,015,084	1,221,742	496,910	3,954,871	162,714	6,851,321	2,497,801	—17,259	305,720	2,174,822	—867,994
New York, Ontario & Western	546	6,037,622	1,383,189	7,706,358	912,983	1,220,757	113,164	3,062,883	174,939	5,484,726	2,221,632	—48,041	175,000	1,998,591	43,018
New York, Philadelphia & Norfolk	112	2,220,191	350,416	2,776,680	322,523	477,535	42,986	1,078,826	112,819	2,034,689	741,991	.....	76,650	665,341	—146,344
New York, Susquehanna & Western	152	1,701,175	495,586	2,465,379	259,817	227,240	19,494	905,347	41,271	1,453,169	1,012,210	9,676	117,258	904,628	180,139
Norfolk Southern	608	1,648,307	628,121	2,439,448	272,390	285,375	48,583	760,378	136,558	1,503,285	936,163	3,518	59,800	879,881	—
Northern Central	469	8,244,803	1,898,390	10,760,183	1,815,601	2,022,193	164,843	5,056,400	250,394	9,309,431	1,450,752	5,365	334,353	1,121,764	—985,601
Peoria & Eastern	351	2,184,768	596,865	2,997,119	400,271	505,514	60,898	1,281,593	59,499	2,307,775	689,344	.....	95,878	593,466	—188,173
Philadelphia & Reading	1,022	29,262,033	5,820,363	36,715,601	3,145,479	6,835,431	422,516	11,860,177	685,819	22,949,422	13,766,179	235,396	842,104	13,159,471	—974,145
Philadelphia, Baltimore & Washington	713	7,863,162	6,347,936	15,784,299	2,337,328	2,512,960	288,535	6,688,295	368,646	12,195,463	3,588,836	.....	483,025	3,105,811	—91,552
Pittsburgh & Lake Erie	215[14]	11,433,342	1,321,825	13,148,845	1,575,846	1,310,231	149,350	3,189,740	239,560	6,464,727	6,684,118	—3,874	276,576	6,403,668	—1,598,102
Rutland	468	1,551,829	960,398	2,838,048	366,218	445,735	71,417	1,119,061	70,016	2,072,447	765,601	.....	104,285	661,316	—50,225
St. Louis & San Francisco	4,732	22,626,225	9,501,299	34,567,878	4,419,052	4,692,163	850,625	12,342,852	1,012,162	23,316,854	11,251,024	.....	1,455,244	9,795,780	620,167
St. Louis, Brownsville & Mexico	501	948,682	501,783	1,573,645	414,594	124,024	23,997	573,656	80,226	1,216,497	357,148	.....	47,500	309,648	42,709
St. Louis Southwestern	797[15]	5,156,857	1,168,180	6,613,254	712,627	1,044,233	265,780	1,646,627	226,676	3,895,943	2,717,311	—6,497	207,519	2,503,295	127,070
St. Louis Southwestern of Texas	703	2,532,219	853,550	3,600,683	905,096	742,269	107,926	1,593,949	168,459	3,517,699	82,984	—2,084	95,726	—14,826	104,476
San Antonio & Aransas Pass	727	2,428,252	917,395	3,547,027	704,369	481,840	50,483	1,329,634	101,616	2,667,942	879,085	.....	103,590	775,585	—94,795
San Pedro, Los Angeles & Salt Lake	1,105[16]	4,059,396	2,231,506	6,706,968	1,233,867	1,119,144	312,739	2,523,110	173,443	5,362,303	1,344,665	—49,742	269,392	1,025,531	326,752
Seaboard Air Line	3,046[17]	12,401,337	3,974,829	18,241,917	2,347,172	2,456,485	604,765	6,168,919	510,921	12,088,262	6,153,655	—8,179	674,000	5,471,476	244,132
Spokane, Portland & Seattle	551[18]	2,715,451	953,762	3,863,563	451,116	281,548	48,149	1,006,767	99,034	1,886,614	1,976,949	—5,462	345,000	1,626,487	883,383
Texas & New Orleans	458	2,200,620	898,631	3,289,240	595,184	582,501	72,966	1,310,175	96,237	2,657,063	632,177	5,481	123,025	514,613	—210,782
Toledo & Ohio Central	444	3,494,775	535,838	4,233,455	599,317	589,521	68,019	1,458,072	82,050	2,796,979	1,436,476	—563	191,189	1,244,724	196,134
Toledo, St. Louis & Western	451	2,561,522	386,447	3,143,860	393,597	457,718	88,976	1,120,440	92,856	2,153,587	990,273	.....	142,250	848,023	—156,228
Vandalia	827	5,928,106	2,021,904	8,854,862	1,155,623	1,616,769	273,565	3,563,354	198,111	6,807,422	2,047,440	.....	277,893	1,769,547	—7,877
Virginian	474[19]	2,650,694	212,516	2,948,266	336,494	503,675	51,396	799,902	76,782	1,768,249	1,180,017	48,412	149,356	1,079,073	699,034
Wabash	2,515	16,983,766	6,183,396	24,996,547	2,835,904	4,029,871	766,369	10,048,570	755,151	18,435,865	6,560,682	—18,435	761,089	5,781,158	—802,249
West Jersey & Seashore	353	1,519,933	3,237,786	5,071,206	796,808	614,728	150,940	2,137,237	106,555	3,806,268	1,264,938	—51,033	229,548	984,357	103,335
Wheeling & Lake Erie	457	4,746,641	509,531	5,630,964	626,643	1,136,215	81,074	2,033,294	137,207	4,014,433	1,616,531	28,668	206,309	1,438,890	—148,718

Mileage operated on April 30, 1910—[1] 4,460 miles; [2] 546 miles; [3] 530 miles; [4] 1,036 miles; [5] 1,249 miles; [6] 843 miles; [7] 168 miles; [8] 293 miles; [9] 781 miles; [10] 4,550 miles; [11] 3,533 miles; [12] 1,724 miles; [13] 348 miles; [14] 191 miles; [15] 773 miles; [16] 979 miles; [17] 3,013 miles; [18] 420 miles; [19] 444 miles. — Indicates Deficits, Losses and Decreases.

Rates on Kanite Reduced.

William H. Blumenstein v. Philadelphia & Reading et al. Opinion by the commission:

Following Masurite Explosive Co. v. P. & L. E. R. R. Co., 13 I. C. C. 405, defendants ordered to cease from charging, in official classification territory, their first class rates on kanite in carload quantities, and double first class rates on kanite in L. C. L. quantities; and to substitute therefor second class rates on carload quantities, and one and one-half times first class rates on L. C. L. quantities. (21 I. C. C. 90.)

Reparation Awarded.

Franklin, Stiles & Franklin v. Southern Express Co. Opinion by the commission:

Defendant's contention that express rates should be a certain percentage higher than freight rates not sustained, as there is no material evidence of record as to the reasonableness of either the express rate or the freight rate.

The alleged erroneous publication of a rate which remains in effect for more than eight years is not a justification for its increase. Advanced rate found unreasonable, rate for the future prescribed, and reparation awarded. (21 I. C. C. 88.)

Rates on Cement Reduced.

Maritime Exchange et al v. Pennsylvania Railroad. Opinion by the commission:

Martins Creek, Pa., is one of a group of cement-producing points, known as the Lehigh cement district, from all of which the rate on cement to Philadelphia, Pa., is the same via all routes, $1.35 per net ton, except as recently modified by the defendant. The defendant's line of road from Martin's Creek to Philadelphia passes through the state of New Jersey for a part of the distance, and the traffic between these points is subject to the jurisdiction of the commission. Upon a complaint attacking defendant's local rate on cement from Martin's Creek to Philadelphia, and also bringing in issue the proportional rate to Philadelphia on cement transhipped to Wilmington, N. C., and points south thereof. For the future the rate on cement from Martins Creek, Pa., to Philadelphia via the line of defendant should not exceed $1.10 per net ton. The restriction by defendant of the 80-cent proportional rate, Martins Creek to Philadelphia, to cement carried by water to Wilmington, N. C., and points south thereof, does not result in undue prejudice to Philadelphia. (21 I. C. C. 81.)

STATE COMMISSIONS.

The California commission has ordered the Atchison, Topeka & Santa Fe to interchange traffic with the Oakland & Antioch Electric Railway at Bay Point, where the lines of the two companies connect. The commission has not laid down any general rule for this procedure, but announces that similar petitions will be decided upon the merits of the several cases. This order, directing joint rates between a steam and an electric road, establishes a new rule in California; and if carried into effect throughout the state will remove the isolation of many electric lines.

The New York Public Service Commission, Second district, has dismissed the complaint in the case in which residents of Ossining ask that morning train No. 94, southbound for New York, be required to stop at Ossining. This train carries a Pullman car and baggage car. The commission says that proof does not indicate that morning train service from Ossining to New York is inadequate either in number of trains, seating capacity, or in schedule running time or methods of operation. The baggage facilities for morning trains at Ossining are adequate. The demand for provision of a parlor car in this service is not supported by proof that such a car would be patronized, beyond that which is afforded by the expressed belief of a single witness for complainants. Testimony of that description is insufficient to overcome the presumption against such use by daily riders over a distance of thirty-one miles. If such proof were adduced, it might afford a reason for requiring a parlor car to be hauled in the existing train service, but it would not in itself be ground for specific order requiring the stoppage of an additional train, though respondent might exercise its option in that respect.

The New York Public Service Commission, Second District, has denied the application of the Delaware & Hudson for consent to discontinue the station at Wrights, Town of Putnam, Washington County, and to establish a new station at or near Luthers Siding, one and one-quarter miles south in the same township. A hearing was had upon the application at Wrights, at which there was a large attendance of the people of the town, as well as residents of Orwell, Vermont, which is situated directly across Lake Champlain from the present station. The company's contention was that the present station was not well located, especially for northbound trains, being just around a sharp curve through the rocks, and that the proposed new point of location is on a straight, level stretch of ground better adapted to the safe operation of trains. Commissioner Huppuch, who heard the case, recommended the denial of the application, and in the opinion submitted by him, it is held that a railway station long established, which is a recognized institution in a locality, should not be removed to a new location unless it appears that the new location is consistent with public convenience and that the contention that the operation of trains would be facilitated by the removal of the station to a point where there is a level stretch of track, there being no direct evidence that operating conditions at the present location are dangerous to life or property, is not sufficient to warrant the granting of the application.

COURT NEWS.

In the United States Circuit Court of Appeals at Philadelphia, June 13, Judge Young filed an opinion sustaining the verdict of the lower court, imposing fines of $40,000 each on the Bethlehem Steel Company, the Philadelphia & Reading, and the Lehigh Valley, for violating the law in the collection of demurrage charges.

The Supreme Court of New Jersey has held unreasonable the ordinance of Jersey City requiring drivers of business wagons to have licenses from the city. This ordinance was enforced during the strike of the wagon men of the express companies last autumn, to the great embarrassment of the express companies. Two suits were brought before the court, one in which the driver arrested for working without a license was engaged in interstate commerce, but the court set aside the conviction of the men in both cases, without finding it necessary to pass on the question of interstate commerce.

The Appellate Division of the Supreme Court of New York, in an opinion by Justice Clarke, holds that the Public Service Commission, First District, in rejecting the reorganization plan of the Third Avenue (surface street) Railroad Company, has exceeded its powers. The decision reverses a decision of the commission, and the result will be to leave in effect the plan of reorganization of this property, which was submitted by the bondholders' committee, December 3, 1909. The court says:

"Upon the facts as they appeared before the commission it would seem that it was bound to approve the issue of the stocks and bonds by the new corporation in accordance with the plan of reorganization, and the power of the commission was confined to a determination of the question as to whether the proposed issue was authorized by sections 8 and 9 of the Stock Corporation law and the agreement for the purchase and sale and adjustment of foreclosure."

The opinion dealt principally with the question as to whether or not sections 9 and 10 of the Stock Corporation law were repealed by the Legislature in 1907, when the Public Service Commission laws were created. On this point Justice Clarke said:

"The main question here presented has not heretofore been considered in any court. It is, have the statutory provisions for the reorganization of railroads, which have existed since 1853 and are now embodied in section 9 to 12 of the Stock Corporation law, been repealed by implication by the provisions of the public Service law?

"It is claimed that the reorganization statute has been repealed by the Public Service Commission act, not directly, but impliably. If the statute has been repealed then I know of no statute under which a reorganization of a railroad can be had. Certainly there are no provisions of the Public Service act which can be availed of. If the provisions for adopting the plan by the purchasers and making it the basis of a new charter are of no effect, then the whole scheme of reorganization is gone, because the adoption of said plan is the very gist of that scheme."

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

H. B. Blanchard has been elected secretary of the Martinique & Lake Superior, with office at New York.

C. B. Ferry has been appointed assistant secretary of the Chicago, Milwaukee & St. Paul, with office at New York, succeeding J. M. McKinlay, deceased.

F. H. Parker, auditor of freight receipts of the Great Northern at St. Paul, Minn., has been appointed assistant comptroller, succeeding G. R. Martin, promoted.

B. Campbell, vice-president of the New York, New Haven & Hartford, has been elected vice-president also of the Central New England, with office at New Haven, Conn.

F. H. Parker, auditor of freight receipts of the Great Northern, at St. Paul, Minn., has been appointed assistant comptroller, and E. J. Willis has been apopinted acting auditor of freight receipts.

William Lee Karnes, assistant secretary of the Kansas City, Mexico & Orient of Texas, has been elected treasurer of the Kansas City, Mexico & Orient, with office at Kansas City, Mo., succeeding E. E. Holmes, resigned.

E. H. McHenry, vice-president of the New York, New Haven & Hartford and the Central New England, at New Haven, Conn., has been appointed vice-president also of the Boston & Maine, with office at New Haven, effective July 1.

J. H. Allen has been elected vice-president and general manager of the Anderson & Saline River, and R. L. Rutherford has been appointed treasurer, both with offices at Pine Bluff, Ark. R. M. Morris has been appointed secretary and general freight agent, with office at St. Louis, Mo.

H. I. Miller, first vice-president of the New Orleans Great Northern, at Bogalusa, La., has been elected president, with office at New York, succeeding C. W. Goodyear, deceased. M. E. Olmstead, general counsel, with office at Harrisburg, Pa., has been elected first vice-president, succeeding Mr. Miller, with office at Harrisburg, and A. M. Trueb, assistant to vice-president, has been appointed assistant to president, with office at Bogalusa. Mr. Miller is also receiver of the Buffalo & Susquehanna, and in addition was recently elected vice-president of the Missouri Pacific.

W. B. Storey, Jr., vice-president of the Atchison, Topeka & Santa Fe, in charge of construction, whose jurisdiction has been extended over the operating department, as has already been announced in these columns, was born November 17, 1857, at San Francisco, Cal., and was graduated in 1881 from the University of California. He began railway work in 1877, as axman on the Southern Pacific, giving up this work at the end of a year to go to college. He returned to railway work in 1881, and until 1893 was rodman, levelman, transitman and assistant engineer of the Southern Pacific. In 1893 he was made assistant engineer of the United States Hydraulic Mining Commission, and from 1895 to 1900, was chief engineer and general superintendent of the San Francisco & San Joaquin Valley, now a part of the Santa Fe. In 1900 he was appointed chief engineer of the Atchison, Topeka & Santa Fe, at Topeka, Kan., becoming chief engineer of the entire system in September, 1906, with office at Chicago; and since September, 1909, he has been vice-president, in charge of construction, with office at Chicago. Mr. Storey has been in charge also of the operating department during the absence of J. W. Kendrick, vice-president in charge of operation, who was granted a six months' leave of absence in December, 1910.

G. R. Martin, who has been appointed comptroller of the Great Northern, with office at St. Paul, Minn., as was previously announced in these columns, was born July 3, 1864, at Evans Mills, N. Y. He attended the U. S. Military Academy at West Point for a time, entering with the class of 1883. He graduated with the master's degree from the College of Law of the University of Minnesota, and he is also a member of the bar of the state of Minnesota. Mr. Martin began railway work in 1885 with the Chicago & North Western as a telegraph operator and agent, and until July, 1890, was employed in the operating department of that road and the Minneapolis, St. Paul & Sault Ste. Marie. He then entered the accounting department of the Great Northern, and in August, 1894, was promoted to assistant auditor of disbursements. Three years later he was transferred to the operating department, and was consecutively special superintendent of the Great Northern; general superintendent of its subsidiary, the Montana Central, and assistant general superintendent of the Great Northern. In March, 1899, he was appointed auditor of disbursements, and was promoted to general auditor in November, 1902. For the first five months of 1905 he was on special duty in the president's office, and was made assistant to the comptroller in May of that year. He was promoted to assistant comptroller in January, 1906, from which office he is now advanced to comptroller.

Operating Officers.

J. G. Grossheim has been appointed superintendent of the Portland & Southeastern, with office at Portland, Ore.

H. D. Earl, who was recently appointed superintendent of the St. Louis Southwestern, at Mt. Pleasant, Tex., and R. L. Garner, who was appointed assistant superintendent of the same road, at Tyler, Tex., have had their jurisdiction extended over the Eastern Texas Railroad.

P. E. Block, vice-president, general superintendent and general freight and passenger agent of the Weatherford, Mineral Wells & Northwestern at Weatherford, Tex., has been appointed general superintendent of the Gulf, Texas & Western, with office at Jermny, Tex., succeeding F. J. Bechely, resigned to accept service with another company.

A. S. Ingalls, assistant general superintendent of the Lake Shore & Michigan Southern, the Lake Erie, Alliance & Wheeling and the Dunkirk, Allegheny Valley & Pittsburgh, having been promoted to general superintendent, F. H. Wilson, assistant general superintendent at Chicago, has had his jurisdiction extended over all divisions, and his office will be moved to Cleveland, Ohio.

N. B. Walton has been appointed assistant to general superintendent of the Grand Trunk Pacific, with office at Winnipeg, Man.; G. S. Cooke has been appointed superintendent of the lines from Winnipeg to Watrous, Sask., with office at Melville, and H. McCall has been appointed superintendent of the lines west of Edmonton, Alta., with office at Edson. The office of trainmaster of the first, second, third, seventh and eighth districts is abolished.

Nathan Gregg Pearsall, whose appointment as superintendent of the Louisiana division of the Texas & Pacific, with office at New Orleans, La., has been announced in these columns, was born at South Florence, Ala. He received a common school education and began railway work in February, 1879, as a brakeman on the Memphis & Charleston, now part of the Southern Railway. He was then consecutively freight conductor and passenger conductor on the Mexican Central; construction train conductor and passenger conductor on the Louisville, New Orleans & Texas, now part of the Yazoo & Mississippi Valley, and division superintendent of the Texas & Pacific at New Orleans. He was then out of service for a time, and in February, 1898, went with the Interstate Transportation Company at New Orleans. He was afterwards general manager of the Avoyelles Railway, now part of the Texas & Pacific; and in June, 1899, was appointed manager of the East Louisiana Railroad, and later general manager of its successor, the New Orleans Great Northern, having been with the latter road during its construction and up to the time of his appointment as above.

Traffic Officers.

Stewart Starr has been appointed traveling freight and passenger agent of the Brinson Railway, with office at Sylvania, Ga.

W. J. Lloyd has been appointed acting general agent of the Erie Despatch, at Denver, Colo., succeeding J. A. Dolan, transferred.

J. G. Kensett has been appointed a traveling freight agent of the Atlantic Coast Line, with office at Greenville, S. C., succeeding W. A. Cooper.

T. P. Clemow has been appointed traveling freight and passenger agent of the Great Northern, with office at Billings, Mont., succeeding B. S. Merritt.

T. H. Daly has been appointed a traveling passenger agent of the Canadian Pacific Lines west of Revelstoke, B. C., with office at Vancouver, B. C.

W. B. Harahan has been appointed a traveling freight agent of the Missouri, Kansas & Texas, with headquarters in New York City, succeeding T. P. Buchanan, resigned.

C. S. Browne has been appointed traveling freight agent of the San Pedro, Los Angeles & Salt Lake, with office at Los Angeles, Cal., succeeding L. A. Casey, promoted.

W. A. Clay has been appointed freight traffic manager of the Anderson & Saline River, with office at Pine Bluff, Ark. (See an item under Executive, Financial & Legal officers.)

W. F. Greaves, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis at Dallas, Tex., has been appointed general agent, with office at Nashville, Tenn. C. W. Smith, commercial agent at Kansas City, Mo., succeeds Mr. Greaves, and F. M. Cole succeeds Mr. Smith.

R. T. Haskins, freight traffic manager, at New York; L. H. Kentfield, general freight agent; A. B. Smith, general passenger agent, and F. C. Coley, first assistant general passenger agent of the New York, New Haven & Hartford, with offices at New Haven, Conn., have been appointed also to the same positions on the Central New England.

S. H. Babcock, manager of the traffic bureau of the Commercial Club of Salt Lake City, has been appointed traffic manager of the Denver, Northwestern & Pacific, with office at Denver, Colo., succeeding to part of the duties of William F. Jones, auditor and general traffic manager.

J. E. Blain, chief clerk to the commercial agent of the New Orleans & Northeastern, the Alabama & Vicksburg, and the Vicksburg, Shreveport & Pacific at Shreveport, La., has been appointed a traveling freight agent, with office at Shreveport, succeeding Charlton Barksdale, resigned.

Fay Thompson, district passenger agent of the Chicago, Rock Island & Pacific at Atlanta, Ga., has been appointed division passenger agent, with office at Oklahoma City, Okla., succeeding H. M. Brown, appointed district passenger agent at Philadelphia, Pa. H. H. Hunt succeeds Mr. Thompson.

W. L. Donaldson, agent of the Lake Shore-Lehigh Valley Route and the Michigan Central-Lehigh Valley Route; and John E. Rogerson, westbound agent of the Michigan Central-Lehigh Valley Route, incident to the closing of the offices of those fast freight lines, have become connected with the freight traffic department of the Lehigh Valley, with office at Chicago. William McMurtie, commercial agent of the fast freight lines at Kansas City, Mo., has been appointed traveling freight agent of the Lehigh Valley, with office at Kansas City.

The jurisdiction of the following officers of the International & Great Northern has been extended over the Texas & Pacific: George D. Hunter, general eastern traffic agent; W. G. Trufant, commercial agent, and D. C. Lorentz, soliciting freight agent, with office at New York; H. H. Taylor, commercial agent at St. Louis, Mo.; G. W. Doll, commercial agent at Cincinnati, Ohio; T. B. Moss, commercial agent at Kansas City, Mo., and James Stuart, recently promoted from traveling freight agent at St. Louis to commercial agent at Denver, Colo., succeeding F. J. Burke, promoted. P. B. Doddridge has been appointed traveling freight agent in charge of St. Louis-Chicago territory, with jurisdiction over both roads, succeeding Mr. Stuart. The jurisdiction of J. B. Payne, commercial agent, and O. E. Duggan, traveling freight agent, of the Texas & Pacific at Louisville, Ky., has been extended over the International & Great Northern. I. M. Griffin, whose appointment as assistant general freight agent of the Texas & Pacific at Dallas, Tex., has been announced in these columns, will continue to act as general cotton agent of the I. & G. N. N. M. Leach, whose appointment as traffic manager of both roads has been announced in these columns, will have temporary headquarters at San Antonio, Tex.

Subsequent to the recent reorganization of the freight traffic department of the western lines of the Canadian Pacific (see *Railway Age Gazette*, April 21, 1911, page 968) changes have been made, effective June 15, by which that department has been divided into the following divisions: Manitoba, Saskatchewan, Alberta, Kootenay and Boundary, and British Columbia. W. C. Bowles, division freight agent at Vancouver, B. C., has been appointed general freight agent of the western lines, with headquarters at Winnipeg, Man., a new office. R. E. Larmour, division freight agent at Winnipeg, has been appointed division freight agent of the British Columbia division, with office at Vancouver; and reporting to him are: F. H. Clendenning, district freight agent at Vancouver; W. H. Gardiner, district freight agent at Victoria, B. C., and A. J. Cambie, who has just been appointed district freight agent at Vancouver, in charge of Vancouver and Westminster terminals and Okanagan lake traffic. George H. Smith, district freight agent at Winnipeg, has been appointed division freight agent of the Manitoba division, with office at Winnipeg. D. C. MacDonald has been appointed division freight agent of the Saskatchewan division, with office at Regina, Sask., and W. H. Allison has been appointed a district freight agent of that division, with office at Saskatoon, Sask., succeeding R. W. Drew, who has been promoted to division freight agent of the Kootenay and Boundary division, with office at Nelson, B. C. John Halstead, formerly division freight agent of the Western division at Calgary, Alta., has been appointed division freight agent of the Alberta division, with office at Calgary. The offices of district freight agent at Regina and at Winnipeg have been abolished.

Engineering and Rolling Stock Officers.

C. C. Fralich has been appointed assistant master mechanic of the Ann Arbor Railroad, with office at Owosso, Mich.

A. W. Munster has been appointed engineer of tests of the New York, New Haven & Hartford, with office at Boston, Mass., succeeding B. S. Hinckley, transferred.

F. S. Rodger, general car and locomotive foreman of the Chicago, Milwaukee & St. Paul at Marion, Iowa, has been appointed assistant district master mechanic of the Superior division, with office at Green Bay, Wis., succeding E. Z. Hermansader, promoted. G. F. Hennessey succeeds Mr. Rodger.

John J. Pelley, roadmaster of the Illinois Central at New Orleans, La., has been transferred to Fulton, Ky., succeeding J. M. Egan, appointed superintendent. C. E. Weaver, resident engineer at New Orleans, succeeds Mr. Pelley. Shelby S. Roberts has been appointed a division engineer, with office at Chicago, succeeding E. I. Rogers, transferred to New Orleans.

C. H. Rae, general master mechanic of the Louisville & Nashville, at Louisville, Ky., has been appointed assistant superintendent of machinery, succeeding Charles F. Giles, promoted. C. H. Hedgcock, chief clerk in the mechanical department, also becomes assistant superintendent of machinery. W. A. Stearns, mechanical engineer, at Louisville, has resigned, to become assistant to the chief mechanical engineer of the American Steel Foundries, at St. Louis, Mo.

Charles F. Giles, assistant superintendent of machinery of the Louisville & Nashville, at Louisville, Ky., has been appointed superintendent of machinery, succeeding T. H. Curtis, resigned. Mr. Giles was born at Rowlesburg, W. Va., November 2, 1856, and entered railway service as an apprentice in the shops of the Baltimore & Ohio at Wheeling in 1873, and in the shops of that road, the Texas & Pacific, the Pennsylvania and the Louisville & Nashville he remained until 1882, in which year he was made foreman on the L. & N. In 1887 he was promoted to the position of master mechanic, at Birmingham; the next year to a similar position at Pensacola, and on October 1, 1902, became master mechanic at the main shops of the company at Louisville. He was appointed assistant superintendent of machinery on February 1, 1904.

John D. Maupin, whose appointment as superintendent of motive power of the Trinity & Brazos Valley, with office at Teague, Tex., has been announced in these columns, was born at St. Catherine, Mo., January 16, 1869. He began railway work in 1889 as a machinist apprentice with the Missouri Pacific-Iron

Mountain system at De Soto, Mo., and on completing his apprenticeship in 1892 was for a year connected with George J. Fritz's contract shop at St. Louis, Mo. He then returned to the Iron Mountain at De Soto, where he was employed in the shops as a machinist for ten years. In 1903 he was appointed gang foreman, and a year later was promoted to general roundhouse foreman, which latter office he held continuously until January, 1909, except for a part of 1907, when he was general foreman of the Texas Central at Walnut Springs, Tex. His next position was general foreman of the Trinity & Brazos Valley at Teague, and in May, 1910, he was promoted to master mechanic of the same company, from which office he has just been advanced to superintendent of motive power as above.

Theodore H. Curtis, superintendent of machinery of the Louisville & Nashville for the last eight years, has resigned and will leave railway work to engage in private business. Mr. Curtis was born at Terre Haute, Ind., August 12, 1866, and entered railway service at the age of 20 as a draftsman on the Cincinnati, Indianapolis, St. Louis & Chicago, now a part of the Big Four. In the drafting rooms of that road and the Brooks Locomotive Works, the Pittsburg Locomotive Works and the New York, Chicago & St. Louis Railroad he remained until 1897, being chief draftsman on the Nickel Plate eight years. In 1897 he was made mechanical engineer of that road, which place he held for two years. Then he went to the Erie in the same capacity. On January 1, 1901, he was appointed mechanical engineer of the Louisville & Nashville, and in August, 1903, was promoted to the position from which he now retires.

T. H. Curtis.

Purchasing Officers.

B. S. Hinckley, engineer of tests of the New York, New Haven & Hartford, has been appointed purchasing agent, with office at Boston, Mass., succeeding C. N. Chevalier, retired.

Frank D. Reed, whose appointment as purchasing agent of the Chicago, Rock Island & Pacific, in addition to his duties as assistant to the vice-president, has been announced in these columns, was born April 22, 1868, near Fort Dodge, Iowa. He was educated in the Chicago public schools, and began railway work with the Pennsylvania Lines at Chicago in September, 1884, as a wheel inspector. In six months he was made clerk and timekeeper, and for five years from 1890 was chief clerk in the car department. He was then promoted to assistant chief of the motive power clerk of the Lines West of Pittsburgh at Fort Wayne, Ind., and in February, 1900, was made chief motive power clerk at the same place. He went to the Rock Island Lines in April, 1904, as chief motive power clerk at Chicago, and two years later was promoted to general storekeeper at Silvis, Ill. He was advanced to assistant to the vice-president, with headquarters at Chicago, in May, 1910, which office he continues to hold.

Special Officers.

H. H. Harrington has been appointed agricultural director of the south Texas lines of the St. Louis & San Francisco.

OBITUARY.

Maurice Brosnihan, formerly traveling freight agent of the Illinois Central, with office at Chicago, died in Chicago on June 5.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE WISCONSIN & MICHIGAN is in the market for 2 locomotives.

THE MEXICO NORTHWESTERN is in the market for 2 Mallet locomotives and 6 Prairie type locomotives.

THE AMERICAN SMELTERS SECURITIES COMPANY, New York City, has ordered 1 mikado locomotive from the Baldwin Locomotive Works.

THE JACKSONVILLE TERMINAL Co. has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works. The cylinders will be 19 in. x 28 in.; diameter of the driving wheels will be 50 in., and the total weight on drivers will be 118,000 lbs.

CAR BUILDING.

THE MEXICO NORTH WESTERN is in the market for 500 logging cars.

THE CUBA RAILROAD has ordered 19 coaches from the American Car & Foundry Company.

THE QUEEN & CRESCENT is in the market for 1,067 miscellaneous freight cars. This item has not been confirmed.

THE LOUISVILLE & NASHVILLE will re-enforce 1,000 freight cars, and is in the market for the steel underframes. This item has not been confirmed.

IRON AND STEEL.

THE GRAND TRUNK has ordered 2,000 tons of bridge material.

THE BALTIMORE & OHIO has ordered 500 tons of structural steel, and is inquiring for 3,500 tons.

THE PENNSYLVANIA RAILROAD has ordered 150 tons of bridge material.

THE DELAWARE & HUDSON has ordered 2,000 tons of rails from the Cambria Steel Company.

THE BOSTON & MAINE has ordered 150 tons of bridge material from the American Bridge Company.

THE UNITED RAILWAYS OF HAYTI have ordered 8,000 tons of rails from the Lackawanna Steel Company.

THE ATLANTIC COAST LINE has ordered 250 tons of bridge steel from the Pennsylvania Steel Company.

THE KANSAS CITY SOUTHERN, mentioned in the *Railway Age Gazette* of May 19 as being in the market for 14,000 tons of rails, has divided an order for this material between the Illinois Steel Company and the Pennsylvania Steel Company.

THE MISSOURI PACIFIC has divided an order for 50,000 tons of rails as follows: 22,800 from the Tennessee Coal, Iron & Railroad Company; 5,000 tons from the Illinois Steel Company, and 22,000 tons from the Colorado Fuel & Iron Company.

SIGNALING.

The contract for installing automatic block signals on the Chicago, Indianapolis & Louisville, between Hammond and Indianapolis (single track), 163 miles, has been let to the General Railway Signal Company. Signals of type 2A will be used, upper quadrant.

The Chicago, Burlington & Quincy will shortly begin installation of automatic block signals between Cameron Junction, Mo., and Harlem, 44.7 miles of single track and 7.3 miles of double track. The single track is used jointly with the Rock Island, and the double track jointly with the Rock Island and the Wabash. All material will be furnished by the General Railway Signal Company. Signals of type 2A, lower quadrant, will be used.

Supply Trade News.

The National Railway Equipment Company is in the market for 100 second-hand 50-ton hopper-bottom gondola cars.

The McKeen Motor Car Company has received an order from the Sand Springs Interurban Railway of Tulsa, Okla., for a second 70-ft. motor car. The Oregon-Washington Railroad & Navigation Company also has placed an order for a 70-ft. motor car. There are now 111 of these cars in service in the United States.

Cornell S. Hawley, hitherto vice-president, general manager and treasurer of the Consolidated Car Heating Company, with office at New York City, was on Monday last elected president and treasurer of the company. Claude C. Nuckols, hitherto superintendent and purchasing agent, was at the same time chosen general manager.

E. G. Schmeisser, formerly assistant engineer in the department of electric traction of the Pennsylvania Railroad, has been elected second vice-president of the Wiener Machinery Company, New York. The capital of this company, which handles machinery, tools and railway appliances, has been recently increased to $25,000. Branch offices have been opened in Pittsburgh, Pa., and Boston, Mass.

Harvey H. Brown has been elected president of the Brown Hoisting Machinery Company, Cleveland, Ohio, succeeding his brother, the late Alexander E. Brown, founder of the company, who died April 26. Other officers were elected as follows: Alexander C. Brown, director and vice-president; George C. Wing, secretary; Charles T. Pratt, treasurer, and Richard B. Sheridan, general manager.

The gross sales of the Western Electric Company, for the month of May, exceeded the sales of the same month in 1910 by 12 per cent.; and at the end of the month the company was employing 26,000 persons, as compared with 25,000 two months ago. The amount of work turned out this year is about 5 per cent. more than it was in the busiest season of 1907, when the company employed 10 per cent. more persons than at present.

A special meeting of the shareholders of the Canadian Locomotive Company, Ltd., Kingston, Ont., was held on May 26 to consider an offer for the sale of the works to a Canadian and English syndicate. Before any definite action is taken, a valuation and a general audit will be made of the company's business. When this report has been handed in the future policy of the company will be determined upon. The capital which the syndicate proposes to put into the business of the company would be derived from the sale of the following securities: $2,000,000 first mortgage sterling bonds; $1,500,000 preferred stock; and $2,000,000 common stock.

TRADE PUBLICATIONS.

Brake Beams.—The American Steel Foundries, Chicago, has issued a 40-page catalogue describing the Simplex brake beams for passenger, freight and tender service.

Chicago & Northwestern.—The passenger department of this line has published an illustrated folder giving a description, with diagrams, of its new passenger terminal at Madison and Canal streets, Chicago.

Cranes.—The Industrial Works, Bay City, Mich., has issued a new general catalogue covering wrecking, locomotive, construction, pillar and hand cranes, pile drivers, transfer tables, portable rail sawing machines and clam shell buckets. The book is handsomely printed and bound, and contains 107 illustrations.

Asphalt Products.—The Standard Asphalt & Rubber Company, Chicago, has published a small booklet on Sarco asphalt products and their uses. Among others, Sarco asphalt paving cement, Sarco waterproofing, Sarco asphalt mastic flooring and Sarco mineral rubber pipe coating are illustrated and briefly described.

Cranes.—The Industrial Works, Bay City, Mich., has published catalogue 104 of its railway and commercial cranes, embracing wrecking, locomotive, construction, pillar and hand power cranes; also pile drivers, transfer tables, portable rail sawing machines and clam shell buckets. These machines are fully illustrated and minutely described.

Lubricators.—The Collins Metallic Packing Company, Philadelphia, Pa., has published a small booklet on the Collins improved wheel-flange lubricators, in which it illustrates this device and points out its characteristic features and advantages. For description of this lubricator, see issue of *Railway Age Gazette* for October 7, 1910, page 675.

Lupton Specialties.—The David Lupton's Sons Company, Philadelphia, Pa., has devoted a 36-page illustrated booklet to the Lupton specialties. Among these are included Lupton steel sash for side walls, Pond continuous sash for monitors and sawtooths, Pond operating device for all types of windows, and Lupton rolled steel skylights for all buildings. Full descriptions and diagrams are given.

Geared Locomotives.—The Lima Locomotive & Machine Company, Lima, Ohio, has published a full catalogue of its locomotives. Special attention is devoted to the Shay gear and rod locomotives. Illustrations of the various types are included and some photographs of the shops are given. Tables giving various dimensions and corresponding code words for ordering by wire are also included.

Roach Rail Joint.—The Reinforced Rail Joint Company, St. Louis, Mo., has issued an illustrated booklet describing its Roach rail joint, which is now in service on several roads. This joint is made in one piece and is heavily reinforced, making its strength equal to or greater than that of the rail. It grips the rail tightly in the center, but allows it to deflect at the end, reducing the danger of breakages. This method of supporting is claimed to prevent any rolling movement in the joint.

Michigan Central.—The passenger department of the Michigan Central has issued a booklet entitled Mackinac Island, describing the summer resorts in northern Michigan; it is fully illustrated and contains detailed maps and a list of special tourist fares to these places. Summer Tours is a booklet by the same company giving useful information regarding tours to Niagara Falls and the Adirondacks. Resorts of the fruit belt of Michigan are described in a pamphlet entitled Near-by Resorts.

Selective Signaling.—The United States Electric Company, New York, maker of the Gill selector and other apparatus used on telephone lines, has issued bulletin No. 702, calling attention to its train order semaphore—a standard semaphore with an electric slot. With this semaphore, used in connection with a selective calling apparatus, a despatcher is put in control of the signal at each one of any number of train-order offices. With this electric slot the semaphore is locked in the stop position so that it cannot be cleared until the despatcher releases it; and he, therefore, has full control over the movement of trains at any station, regardless of the absence of the station operator. The clearing of the signal is effected by reversing the battery used in calling.

In consideration of the surrender of the Northern Territory by South Australia, the Commonwealth Government undertake to construct a railway from Port Darwin southwards to a point on the northern boundary of South Australia proper, thus linking the north and the south of the continent, and adding greatly to the defensive strength of the country. The Commonwealth Government are to acquire the Port Augusta Railway, and are to construct a line from a point on the Port Augusta Railway to connect with the other part of the Transcontinental Railway at a point on the northern boundary of South Australia proper. The Commonwealth Government are also authorized to construct a railway westerly from a point on the Port Augusta Railway to a point on the western boundary of South Australia proper. These schemes will facilitate the construction of the other great transcontinental system to connect the east of Australia with the west, in anticipation of which Western Australia joined the Federation in 1900. The undertaking has become more feasible of late through the discovery of artesian water along the proposed route in Western Australia.

Railway Construction.

New Incorporations, Surveys, Etc.

ARIZONA & SWANSEA.—Construction work has been started on an extension, it is said, from Swansea, Ariz., to the Clara consolidated copper district, six miles.

ATLANTIC COAST LINE.—A contract is said to have been let to W. Z. Williams & Co., Macon, Ga., for constructing new yards east of the Augusta city limits. The improvements will cost between $85,000 and $90,000. There is also to be some revision work carried out on the Charleston & Western Carolina.

CAMP CREEK RAILWAY.—Incorporated in Montana with $100,000 capital, to build from Manhattan, Mont., in the Camp Creek country, through an agricultural district for about 20 miles. Preliminary survey has been made and most of the right-of-way secured. A. M. Harvey, Livingston; Clancey Salesville, A. J. Walrath, H. S. Buell and F. L. Benepe, all of Bozeman, are directors.

CHARLESTON & WESTERN CAROLINA.—See Atlantic Coast Line.

GRAYS HARBOR ELECTRIC.—This company will build a line, it is said, from Raymond, Wash., to South Bend.

GREAT NORTHERN.—A new branch, called the Cherry Valley branch, has been opened for business on the Cascade division, from Monroe, Wash., west to Tolt, 17.9 miles.

INTERCOLONIAL RAILWAY.—An officer writes that the Canadian government will build branch lines as follows: Dartmouth, N. S., northeast to Deans, 73 miles; Sunny Brae, east to Guysborough and Country Harbor, 80.5 miles, and from Alba, northeast to Baddeck, in Cape Breton, 22 miles. The lines have already been located and bids will probably be asked in the near future, and construction work started within three months. The improvements call for putting up stations, freight houses, engine houses and water tanks. The branches are being built to carry coal, farming commodities, fish and lumber.

KAMAS VALLEY.—Preliminary surveys have been made for the first section of a line to be built from Wanship, Utah, on the Union Pacific, to Woodland, 18 miles. It is proposed to eventually extend the line to Park City and up Provo canyon to the Uintah reservation. R. W. Barnes, Kamas, is the principal promoter, and H. S. Joseph is chief engineer. S. W. Stewart, Salt Lake City, is interested in the project.

LEWISBURG & NORTHERN.—See Louisville & Nashville.

LOUISVILLE & NASHVILLE.—An officer writes that contracts have been let for double-tracking and improvement work between Covington, Ky., and Paris, to the following contractors: Boxley Brothers Company, Quincy; Patterson & Griffin, Pittsburgh, Pa.; Hough & Spradlin; C. J. McKinney and Callahan Construction Company, Knoxville, Tenn.; J. H. Flick Construction Company, Chicago; Robert Grace Contracting Company, Cleveland, Ohio, and Price Construction Company, Middleboro, Ky.

According to press reports, surveys have been made for the Lewisburg & Northern, from a connection with the Louisville & Nashville, at Maplewood, Tenn., just north of Nashville, through the counties of Davidson, Williamson, Rutherford, Marshall, Giles and Lincoln. Right-of-way has been secured for most of the line. At the Tennessee-Alabama state line connection is to be made with the new double-track line to be built to Athens, Ala., under the name of the Nashville & Decatur. In addition to building a bridge at Nashville, Tenn., bridges are to be put up across Elk river in Tennesese, near the Alabama state line; at Mulberry and at Locust forks, on the Warrior river in northern Alabama. The plans of the L. & N., it is said, include piercing five or six tunnels in Tennessee. From Athens, Ala., south to the freight yards at Boyles, the grades and curvature will be reduced and a second track is to be added. Nearly all the right-of-way for the second-track work in Alabama has been secured.

OREGON ROADS (Electric).—The Lane County Asset Co., Eugene, Ore., has given a grading contract to George Perry & Co., it is said, for building an electric line from Eugene to Elmira.

OREGON SHORT LINE.—Work has been started, it is said, on the Salt Lake & Idaho, from Lucin, Utah, north to Burley, Idaho, via the Raft river valley, about 100 miles.

PORTERVILLE NORTHEASTERN.—This company, which expects to begin operating trains from Porterville, Cal. to Springville, 16 miles, on July 1, it is said will extend the line to the entrance of Sequoia National Park, eight miles. Surveys have been made.

RICHWOOD & GAULEY.—Incorporated in West Virginia with $75,000 capital, to build a line along Cherry river in Nicholas county, W. Va., to open up coal and timber lands. Connection is to be made with a line already built at the junction of Cherry and Gauley rivers. The incorporators include: C. S. Weston, W. Briggs, J. M. Oakford and F. L. Space, Scranton, Pa., and H. W. Armstrong, Richwood, W. Va.

SALT LAKE & IDAHO.—See Oregon Short Line.

SAVANNAH, AUGUSTA & NORTHERN.—This road has been extended from Garfield, Ga., to Stevens crossing, 14 miles.

SOUTHERN PACIFIC.—Announcement has been made that work on the double-track line from Rocklin, Cal., west to Colfax, which has been under way for some time, has been finished.

This company will double-track its line, it is said, between Pasadena, Cal. and Huntington drive, South Pasadena, and electrify the same.

Work is soon to be started, it is said, on a line from Fernley, Cal., and Lassen county.

According to press reports, this company will electrify the line between Riverside, Cal. and Colton.

SOUTHERN & TIDEWATER.—Incorporated in California with $800,000 capital, to build from Santa Monica, Cal., near Los Angeles, via the Maribu ranch to Oxnard, 67 miles. The incorporators include: M. K. Rindge, F. H. Rindge and N. D. Darlington.

SPOKANE INTERNATIONAL.—The Bayview branch has been opened for business from Corbin Junction, Idaho, south to Bayview, 12 miles, and the Coeur d'Alene branch has been opened for business from Coeur d'Alene Junction, south to Coeur d'Alene, 10 miles.

ST. LOUIS, ARCADIA & JEFFERSON CITY.—Incorporated in Missouri with $250,000 capital, and headquarters at St. Louis, Mo. The plans call for building an interurban line from St. Louis to Fenton, 15 miles. The incorporators include: T. G. Portis, C. F. Vogel, E. R. Kinney and R. M. Hamlin, St. Louis, and H. D. Mackey, Springfield.

TAOS, SIERRA NEVADA & SAN FRANCISCO.—This company has been incorporated in New Mexico with $800,000 capital, and office at Taos. The plans call for building 750 miles of railway through the counties of Taos, Rio Arriba, Santa Fe, San Juan, Colfax and Union, in New Mexico, and the southern counties of Utah. One terminus is to be at Fort Sumner, N. Mex., on the Santa Fe cut-off, and the other on the Colorado & Southern in Union county, near Amistad, passing through Santa Fe and Taos. H. S. Annamaker, president, Amistad; F. Hamm, vice-president, Dallas, Tex.; J. S. Holland, second vice-president; J. Gill, secretary, Clayton, N. Mex.; A. C. Probert, treasurer, Taos, and W. P. Halliday, chief engineer, Fort Worth, Tex.

WESTERN PACIFIC.—According to press reports, work will soon be started on a branch from near Marysville, Cal., to Susanville.

RAILWAY STRUCTURES.

ALBION, PA.—According to press reports, the Bessemer & Lake Erie has plans made for improvements, to include enlarging the yards at Albion, building new sidings and putting up several new bridges.

KALAMAZOO, MICH.—The Lake Shore & Michigan Southern will build a brick freight house on concrete foundation, 40 ft. x 110 ft.; second floor 40 ft. x 74 ft. In connection with the freight house this company will build 1,600 ft. of team track, served by brick driveways.

MORGANTOWN, W. VA.—The Morgantown & Kingwood has given a contract, it is said, for building shops at Morgantown, to cost $40,000.

NASHVILLE, TENN.—See Louisville & Nashville under Railway Construction.

NEW CASTLE, PA.—According to press reports, the Pittsburgh & Lake Erie will put up a new passenger station at New Castle, also shop buildings.

Railway Financial News.

Algoma Central & Hudson Bay.—The Manitoulin & North Shore, extending from Sudbury, Ont., to Crean Hill, 23 miles, and controlled by the A. C. & H. B., is now called the Algoma Eastern Railway.

Atlanta, Birmingham & Atlantic.—S. S. Palmer of New York, and Francis R. Hart of Boston, Mass., have been made members of the general protective committee representing the securities of the railway company and of the Atlanta & Birmingham Construction Company; the Georgia Terminal Company; the Alabama Terminal Company and allied companies. The committee now consists of: E. S. Marston, chairman; Frederick Ayer, Samuel Carr, John I. Waterbury, S. S. Palmer and F. R. Hart.

Boston & Maine.—At an adjourned meeting of the stockholders at Boston, June 13, the consolidation of the Worcester, Nashua & Rochester with the Boston & Maine was approved.

Bruce Mines & Algoma Railway.—A press despatch says that this property has been bought by business men of Sault Ste. Marie, Mich. The road runs from Bruce Mines, Ont., to Rock Lake. See also item in Construction News.

Central of Georgia.—The company has deposited with the trustees of the first and second preference income bonds, money to pay the interest which the Superior Court of Chatham county, Ga., found was due for the year 1907.

Chicago & Eastern Illinois.—O. S. Lyford, vice-president, with office at Chicago, has been elected a director for one year, succeeding Frank Trumbull of New York, resigned.

Chicago, Rock Island & Pacific.—The Des Moines, Iowa Falls & Northern first mortgage 5 per cent. bonds, dated 1901, have been called for redemption on July 1, 1911, at 105.

Denison, Bonham & New Orleans.—The Missouri, Kansas & Texas has bought all of the outstanding securities of the Denison, Bonham & New Orleans, consisting of $50,000 stock and $325,000 bonds. The D. B. & N. O. runs from Bonham Junction, Tex., to Bonham, 24 miles.

Denver & Rio Grande.—At the meeting of the board of directors on June 8, action in regard to the dividend on the preferred stock was postponed until June 13 in order to allow Blair & Co., and Speyer & Co., both of New York, to consult with George Gould.

Des Moines, Iowa Falls & Northern.—See Chicago, Rock Island & Pacific.

Great Northern.—The outstanding $500,000 Minneapolis Western first mortgage 5 per cent. bonds are to be paid at maturity on July 1.

Illinois Central.—Bankers in New York say that this company has concluded negotiations for the sale of refunding 4 per cent. bonds to the amount of $10,000,000 to Kuhn, Loeb & Co. The price paid to the railway company is believed to be above 96; but it does not appear that the Executive Committee of the road has yet taken formal action.

Intercolonial.—This Canadian government railway has acquired thirteen railways in the maritime provinces which become branch lines of the I. C. R., and a part of the government system. The railways it is about leasing are the Valery property of the Arcadian Coal Company; the Oriental railway; the Hampton & St. Martin's; the Albert railway; the Moncton & Buctouche; the Caraquet railway; the Gulf shore railway; the York and Coulton; the International; the Temiscouata the New Brunswick & Prince Edward Island; the Elgin & Havelock, and the Kent Northern. The railways are to be leased on terms and conditions approved by the Government Railways Managing Board, the value of the railways to be fixed by the judge of the exchequer court; based on the report of the chief engineer of the government railways. The amount of the rental to be paid will not exceed, for the first five years of the lease, 3 per cent. of the fixed value; for the second five years, 3½ per cent., and thereafter 4 per cent. These railways was mostly short roads with poor service and old rolling stock, and with their acquisition by the I. C. R. will be brought up to the standard of that road.

International & Great Northern.—The property and franchises of this company were sold at auction by the receivers at Palestine, Tex., June 13, for $12,645,000; the purchaser being a committee headed by Lawrence Greer, understood to represent the Gould interests. This property went into the hands of a receiver on February 26, 1908. The plan of reorganization proposed by a committee of the third mortgage bond holders, was outlined in the *Railway Age Gazette* May 19 last, page 1188; and the general acceptance of this plan was indicated by an item published in this column last week.

Lakes Champlain & Moriah.—This company has asked the New York State Public Service Commission, Second district, for authority to increase its capital stock from $200,000 to $400,000, the additional $200,000 to be used to reimburse the treasury for expenditures which have been made to the property during the past five years. The petition shows how the expenditures made have produced an increase in business. The amount of freight carried has increased from 458,000 tons in 1904 to 971,000 tons in 1910. No dividends have been paid since 1893, except one of 3 per cent. in 1899. Since 1899 the net earnings have all been expended in improvements. This road, eight miles long, extends from Port Henry, N. Y., to Mineville, N. Y., and is owned by the iron ore interests which furnish most of its business.

Louisiana Southern.—It is said that the stockholders are to vote in the near future on the question of increasing the capital stock from $300,000 to $1,000,000, and on issuing $1,000,000 first mortgage refunding bonds.

Maine Central.—The stockholders are to vote on July 1 on the question of authorizing the merging of the Somerset Railroad and the Sebasticook & Moosehead with the Maine Central, under the provisions of an act recently passed by the Maine legislature. The stockholders are also to vote on the question of leasing the Portland terminal. See this company below.

Missouri, Kansas & Texas.—See Denison, Bonham & New Orleans.

Missouri Pacific.—The Nebraska railway commission has granted the company's application for authority to issue $20,000,000 in notes for permanent improvements.

National Railways of Mexico.—The company will pay on July 1 the $3,661,000 consolidated mortgage 4 per cent. bonds of the Mexican Central and the assenting 4 per cent. bonds and registered income bonds aggregating $49,547. The money for this refunding was raised through the recent sale of $10,000,000 two year 4½ per cent. notes.

Pere Marquette.—Through the Bankers' Trust Company the Guaranty Trust Company and White, Weld & Co., New York, this company has sold equipment trust gold notes to the amount of $870,000, bearing 5 per cent. interest. The notes are dated June 1, and mature in instalments half yearly up to June 1, 1921. The equipment bought cost $1,023,913; the balance having been paid already by the company. The purchase included 50 locomotives, 12 passenger cars and two combination mail and baggage cars.

Portland Terminal Company.—This is the new name of the Portland (Maine) Union Railway Station Company. The old company issued $300,000 first mortgage 4 per cent. bonds due 1927-1929, guaranteed jointly by the Boston & Maine and the Maine Central. See also item under Railway Structures.

St. Louis & San Francisco.—Frank Trumbull, chairman of the board of the Chesapeake & Ohio, has resigned from the board of directors of the St. Louis & San Francisco; the Chicago & Eastern Illinois; the Evansville & Terre Haute; the Kansas City, Ft. Scott & Memphis, and the Kansas City, Memphis and Birmingham. The resignation is due to the press of other business.

Wabash-Pittsburg Terminal.—The taking of testimony of George J. Gould and Joseph Ramsey, Jr., in the suit of the Central Trust Company, New York, to foreclose the Wheeling & Lake Erie general mortgage, has been postponed until fall; and all of the other litigation brought by the Wabash-Pittsburg Terminal Reorganization committee against the Wabash Railroad has been put off until fall.

Wabash Railroad.—See Wabash-Pittsburg Terminal.

Wheeling & Lake Erie.—See Wabash-Pittsburg Terminal.